aking B tlenecks
ON THE LANER
PAGE 67

eamline Production:
500% M re Output
with 20 More Men
PAGE 77

Ne Uses of
TOOL S EEL TUBING
AGE 89

Pl stics for
Production Tooling
PAGE 101

PRODUCTION ROUND-TABLE IN DETROIT
PAGE 104
DECEMBER, 1944

The TOOL ENGINEER

Official Publication of
American Society of Tool Engineers

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ELMIRA, N.Y.

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PRECISION LATHE

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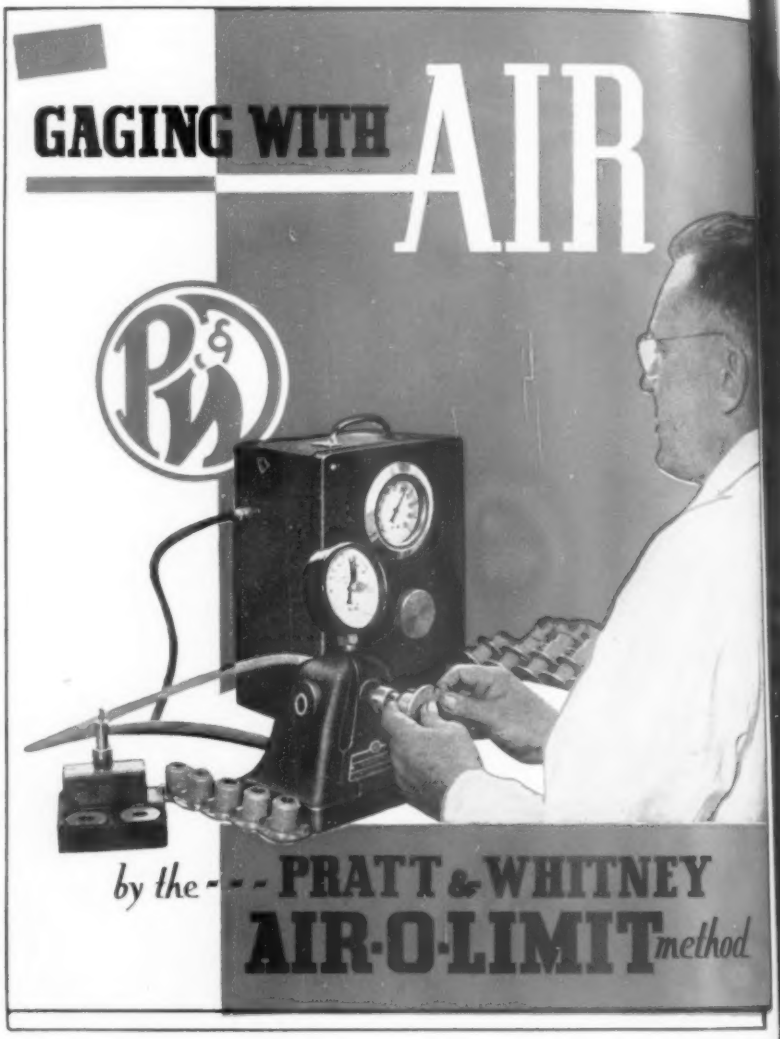
LATEST INFORMATION

on the P&W Air-O-Limit Internal Comparator



New free bulletin just off the press gives you complete facts and figures on this swift, accurate, dependable gage that has broken many a war-time production bottleneck.

AN AIRPLANE engine manufacturer speeded up the I. D. inspection rate of his master-rod bearings by 500% with the P&W Air-O-Limit Internal Comparator. *Yet the gage never touched the inside of the bearing!* That's because the Air-O-Limit gage works on the "air gap" principal . . . compressed air is forced through tiny nozzles at the end of a spindle, and when the bearing is slipped over the spindle the back pressure of the compressed air is registered on a precision pressure indicator calibrated to read in "tenths." Other Air-O-Limit models omit this non-touching feature, but operate on the same principle. All of them have been doing a man-sized job on the war production front and will keep right on giving swift, accurate readings as industry swings over again to peacetime output. This newest bulletin has the complete Air-O-Limit story from A to Z . . . it is free to any executive who requests it on his letterhead.

Write for this new bulletin.

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Division Niles-Bement-Pond Company

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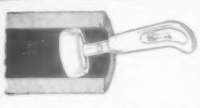
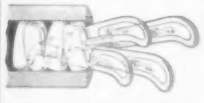
TeBo Gages

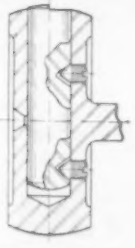
NOW produced in America for American Industry



ONE OPERATION
Checks Minimum and Maximum Tolerances



REVEALS BORE CONDITION AT ANY POINT



ADJUSTABLE FOR CHANGE OF TOLERANCES

Check Bores in ONE Operation More Accurately 60% Faster Than Conventional Type Plug Gages

TeBo GAGES, long the favorite bore checking instruments of Swedish and other European precision workers, are now produced by Standard Gage Company. Considered by users the most desirable fixed limit type gage, TeBo can make a tremendous contribution to precision in American mass production. It performs, in *one* operation, the several functions required of plug gages, with an ease and accuracy that is a revelation to expert craftsmen.

With TeBo Gages, both minimum and maximum limits may be checked in *one* operation. They reveal the internal conditions of the bore at any point, indicating such factors as out-of-round, taper, belling, as well as dimensional deviations. They can be used with equal accuracy in soft as well as hard metals. May be used in thin walled bores without risk of distortion.

The chromium plated TeBo Gage head is a section of a true sphere, the ideal shape for internal gaging. It passes through a bore freely, without jamming or forcing. A spherical projection controls maximum tolerance measurements. Standard Gage has added adjustability to this projection by means of two ingenious set screws.

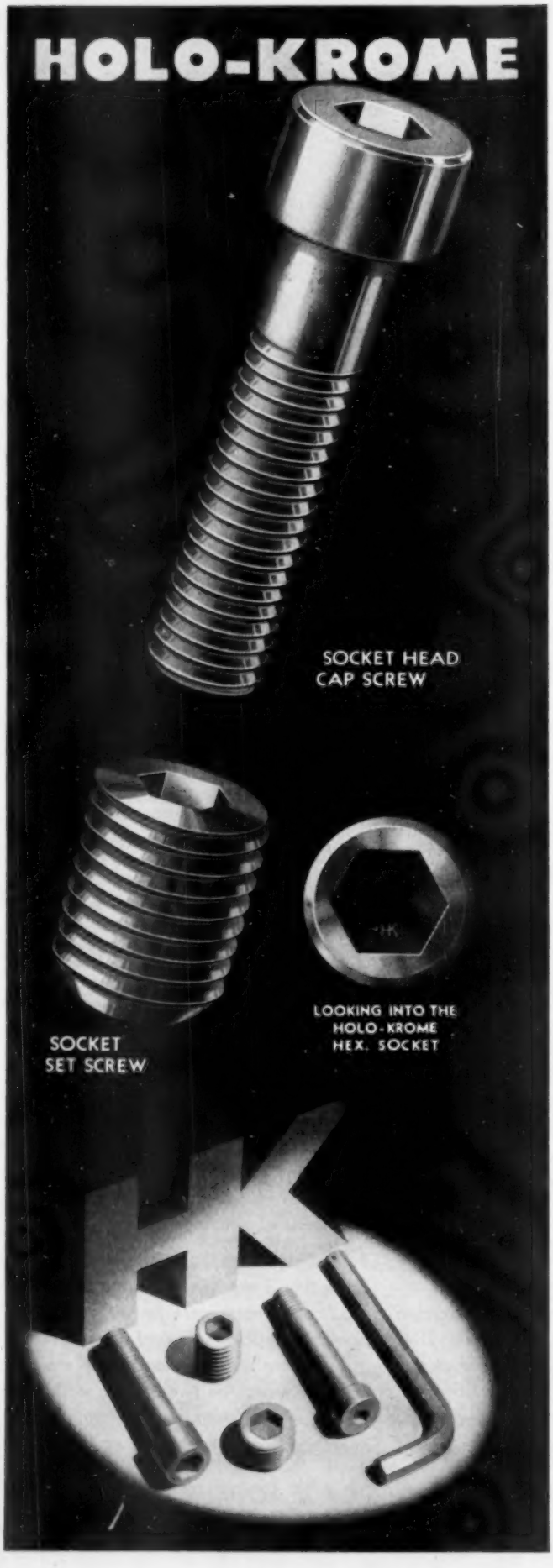
TeBo Gages are light in weight and precisely balanced. They minimize fatigue and may be used over long periods without strain. Their operation is so simple and direct and their findings so easily understood that major gaging operations may be entrusted to workers of slight technical skill. Users report savings up to 60% in gaging time through use of TeBo Gages.

ARMY (F) NAVY

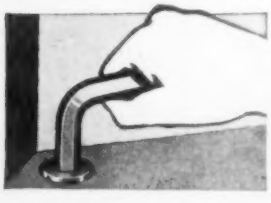
WRITE FOR NEW TeBo GAGE BOOKLET

TeBo Gages Patented in U. S. and Foreign Countries. Other Patents Pending.

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.



Design and Production Engineers, in addition to their war-time activities, find time to blueprint future plans in preparation for the day they can be put into production. Machines and parts which will be required to sustain unusual stresses and vibrations must have their component parts securely fastened. Now is the time to investigate—prepare for tomorrow's production today!



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SOCKET SCREWS

The BETTER Fastening Method

Design and Production Engineers find the assistance given by Holo-Krome Fastening Engineers extremely valuable in planning their production schedules. Holo-Krome FIBRO FORGED Socket Screws, Completely Cold Forged by the Holo-Krome patented method, do the job for which they are intended with Guaranteed Unfailing Performance.

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VOLUME XIV DECEMBER, 1944 NUMBER 6

THE TOOL ENGINEER

T.M. REG. BY AMERICAN SOCIETY TOOL ENGINEERS

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TECHNICAL FEATURES

More Planer Work in Less Time 67
Forming Copper Tubing on the Turret Lathe 72
New Machine and Tool Design Speeds Aircraft Parts Output 73

STREAMLINED PRODUCTION:
500% More Production
With Only 200% More Manpower 77
Uses of Tool Steel Tubing 89
Convert to Metric? NO! 93
Production Data Sheet 97
The Crib 98
Tool-Testing Lathe 99

MEN, MATERIALS AND MACHINES

Plastics for Tools 101
PRODUCTION Round-Table:
Detroit Sees Machine Tools
as Key to Production Costs 104

DEPARTMENTS AND SPECIAL FEATURES

Production Perspectives 65
Machine Tool News 109
Capital Communique 111
Industrial News Digest 115
Greenie— cartoon feature..115
Motor Memos 128
New Equipment 162
New Literature 186
Handy Andy Says 194
A. S. T. E. Doings 200
Passing Parade 212

•

Classified Advertising....222
Advertisers' Index 226

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Publisher's Letter

THIS month's PRODUCTION Round-Table was conducted in Detroit. Playing host to six prominent executives, we sought first hand information on probable postwar trends in the mass production automobile industry.

We believe the answers to our questions in Detroit (see page 104) make one of the most newsworthy Round-Table reports to date.

Most significant is the fact that all of these top men in the Motor Capital are convinced that the key to postwar industrial prosperity lies in utilization of improved machines and methods.

•

A few months ago, planning for postwar production hinged on estimates of consumer markets. Today, thinking is centered on compensating for inevitably higher postwar manpower costs, on cutting finished product costs.

Although the auto industry envisions the largest market in its history—7,000,000 units annually two years after war ends—Detroit production men are concerned about postwar manufacturing costs. They are continually searching for faster and more economical manufacturing methods.

•

Detroit literally has hung out a sign reading:

"WANTED: New and improved machine tools, production methods and skills to cut costs."

If producers of machines and tools are concerned about war-built surpluses glutting their postwar market, let them read what Detroit production men said at our Round-Table:

Said one executive: "Machine tool builders will have a postwar market exactly commensurate with what they offer us."

Another said: "The builders need not worry about the surplus machine tools if they offer machines that are better than those we are using today."

Will the auto industry gobble up a big chunk of surplus machine tools? Emphatically "NO".

•

It will buy DPC equipment only to get auto lines started, only until machine tool builders can supply their needs. And when improved machines are offered, "Detroit will replace its pre-war equipment. It will not be able to afford less efficient war-built equipment."

Therein lies the secret of the auto industry's high output, low-cost production. New machines and tools produce faster and cheaper. Detroit must buy them to stay in business.

Cordially yours,

Roy T. Bramson

Publisher

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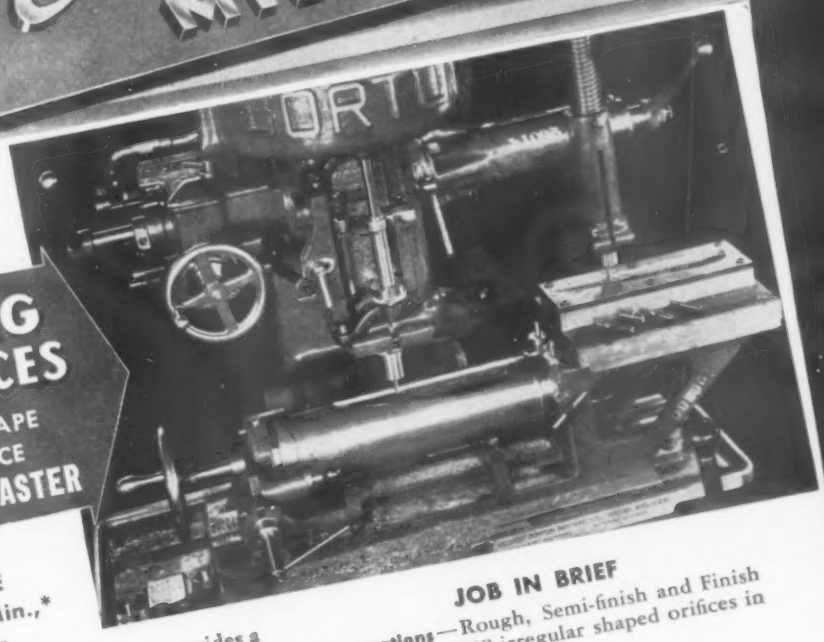
The outstanding performance of Logan Lathes in sustained accuracy and speed results from the exacting care that goes into every detail of construction. In the final inspection, a point-by-point check of the entire machine assures a completed assembly ready for production service. Of equal importance, all individual parts and all sub-assemblies are thoroughly tested as they are manufactured to prevent incorporation in the machine of any part not up to standard. The rigorous checking of parts, sub-assemblies, and the final inspection, strictly control the consistent accuracy and quality characteristics of Logan Lathes. Ask your nearby Logan Lathe dealer, or write for latest catalog describing all models of Logan Lathes.

Logan LOGAN ENGINEERING CO.
CHICAGO 30, ILLINOIS
A NAME TO REMEMBER WHEN YOU THINK OF LATHES

GORTON

SPECIALISTS FOR OVER 50 YEARS IN

Tracer-Controlled MILLING



PROFILING *TWO* ORIFICES

Of IRREGULAR SHAPE
In TUBULAR PIECE
From ONE FLAT MASTER

SIX Operations Completed on ONE Machine in 40 Min.,* Floor to Floor

Gorton Tracer-Control Duplicating provides a simple, fast and accurate means for machining irregular shapes in parts like this Bronze Re-coil sleeve shown above. Specifications for this job called for an orifice on opposite sides of the sleeve.

Both orifices required a rough, semi-finish and finish cut—the latter with a 1/4" diameter end mill to produce 1/8" radii at the two corners. Only one set-up is necessary to complete the six operations (3 cuts around each of two orifices) accomplished with a high degree of uniform accuracy, in 40 minutes, floor-to-floor time.*

The simplicity of Tracer-Controlled operation permits even the most difficult work to be accomplished by inexperienced help.

*NOTE—Time greatly reduced in other plants by using a battery of six or more Gorton Duplicators in multiples of three (1 for each cut) eliminating ALL cutter changes.

JOB IN BRIEF

6 Operations—Rough, Semi-finish and Finish Milling of *TWO* irregular shaped orifices in sleeve.

Material—Bronze.

Cutters—(only 3 needed)—Four-flute, fast spiral end mill, 7/16" diameter, two End Mills, 3/8" and 1/4" diameter.

Speed—1900 r.p.m.

Feed—Manual.

Production—40 minutes per sleeve.

GORTON FREE ENGINEERING SERVICE

You are invited to consult Gorton engineers on any jobs applicable to Gorton equipment. Please submit details of your job to your nearest Gorton Dealer or Factory at Racine, Wisconsin. Recommendations made without charge or obligation.

The *Right* Size The *Right* Type of Machine for Every Job . . .
From 2 oz. to 2 ton

DIE BLOCKS

Tracer-Controlled MILLING

Tracer-Controlled DUPLICATING

Tracer-Controlled ENGRAVING

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CUTTER GRINDERS
ETCHING MACHINES
2 & 3 Dimensional PANTOGRAPHS
Vertical & Universal Head Super-Speed MILLERS
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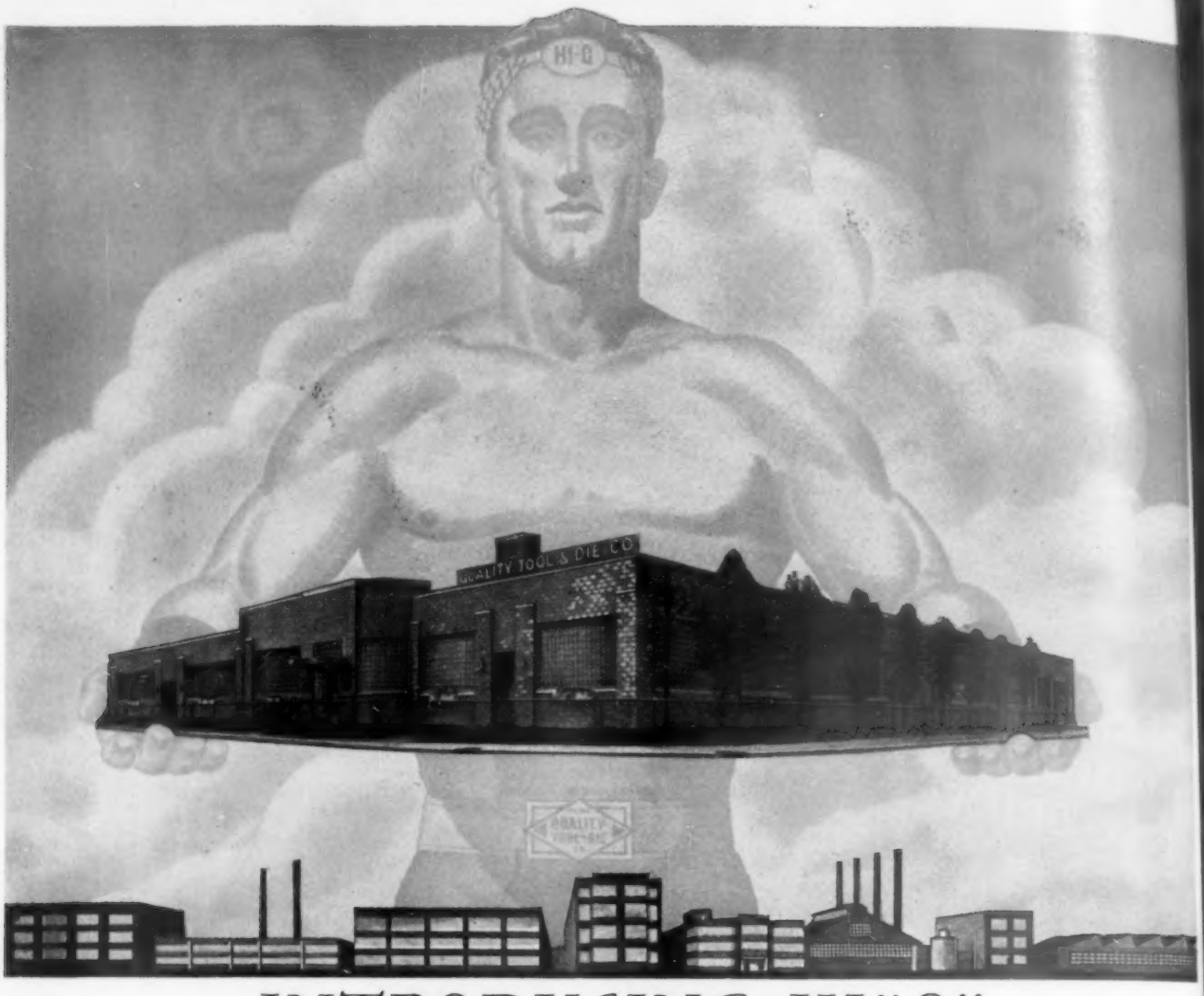

INTRODUCING HI "Q"

Symbol of the Spirit of the Quality Tool & Die Co.

Companies, too, are PEOPLE . . . not just rows of fine machines and piles of masonry. And as "people" they are living things—capable of ideals and a spirit.

The Quality Tool & Die Company owes any success it enjoys to the ideals and spirit behind that success . . . ideals of genuine helpfulness in solving the gaging and tooling problems of its customers . . . ideals that will not allow any compromise with Quality . . . ideals that inflexibly demand the best that is in us.

Backing up these ideals, there is a Spirit at the Quality Tool & Die Company. . . A spirit of pride in jobs well done . . . A spirit of adventurous pioneering of new and better methods . . . A spirit which means that any job and every job that we do for you must be to YOUR entire satisfaction. These ideals and this Spirit are well known to our customers. They frequently comment on this because it all works to their advantage.

We invite YOU to become acquainted with Hi "Q" . . . Symbol of the Spirit of the Quality Tool & Die Company.

Stay with 'em... Buy War Bonds!

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Manufacturers of "Quality" Products

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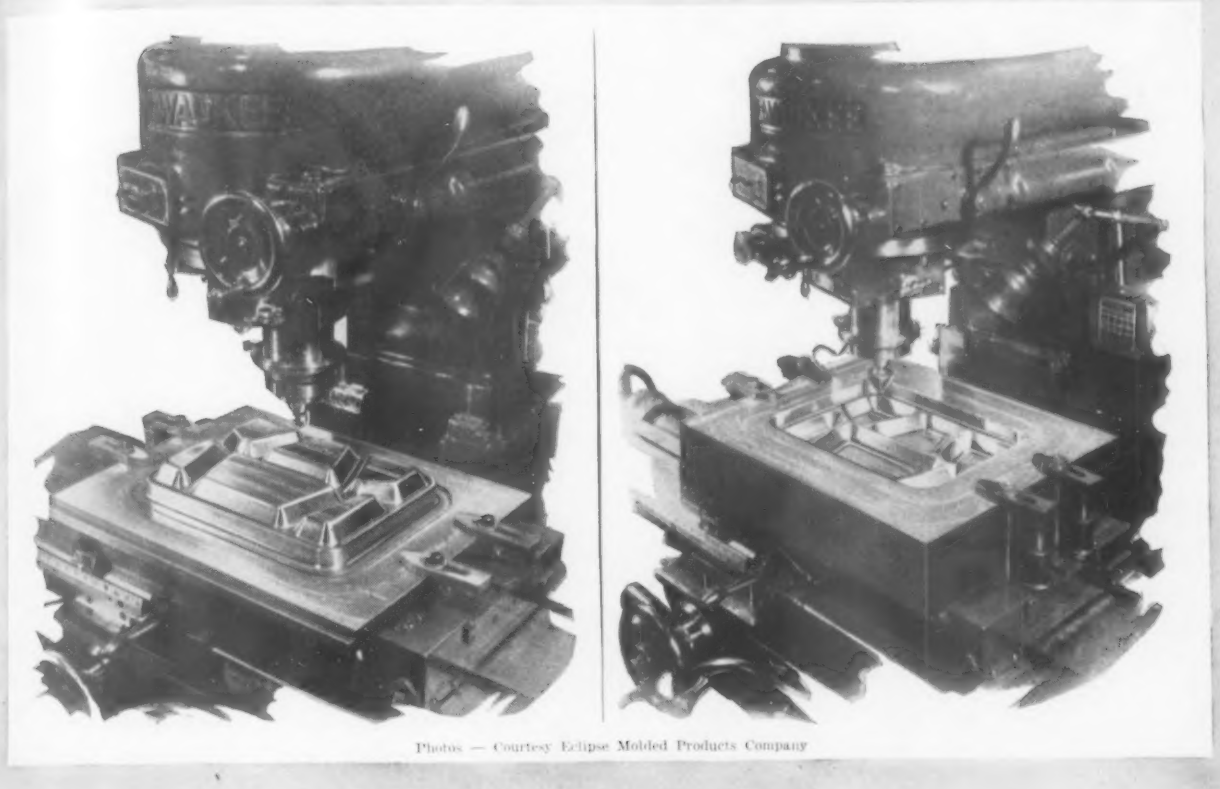
ARMY NAVY

EST. 1929 QUALITY TOOL & DIE CO.

How would you handle this Job in your Shop?



Photos — Courtesy Eclipse Molded Products Company

1001-PC

Molds for plastics pose some tough milling problems occasionally. Here's a tray mold — that could have been difficult, but it was completed on a Milwaukee Rotary Head Milling Machine with typical speed, economy, and accuracy.

Read this job report —

TRAY MOLD

CAVITY SIZE — width, 12 inches, length, 15½ inches, depth, 1½ inches.

Time required for milling both mold halves complete — 219 hours.

All form cutters milled to correct size and shape on the Milwaukee Rotary Head Milling Machine.

Check these advantages of the Milwaukee Rotary Head Milling Machine and how you can benefit from them in your own shop:

DIRECT . . . mills mold cavities in a single set-up without the aid of templets or models.

ACCURATE . . . chances for error are eliminated because there is no change in set-up. Exact control of all combinations of cutting movements—possible only with this machine—transmits mathematical precision to the work.

FAST . . . initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

Write for Bulletin No. 1002C and complete information.

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • MIDGETMILL • SPEEDMILL • FACE MILL GRINDER • AUTOMETRIC JIG BORER • CENTER SCOPE.

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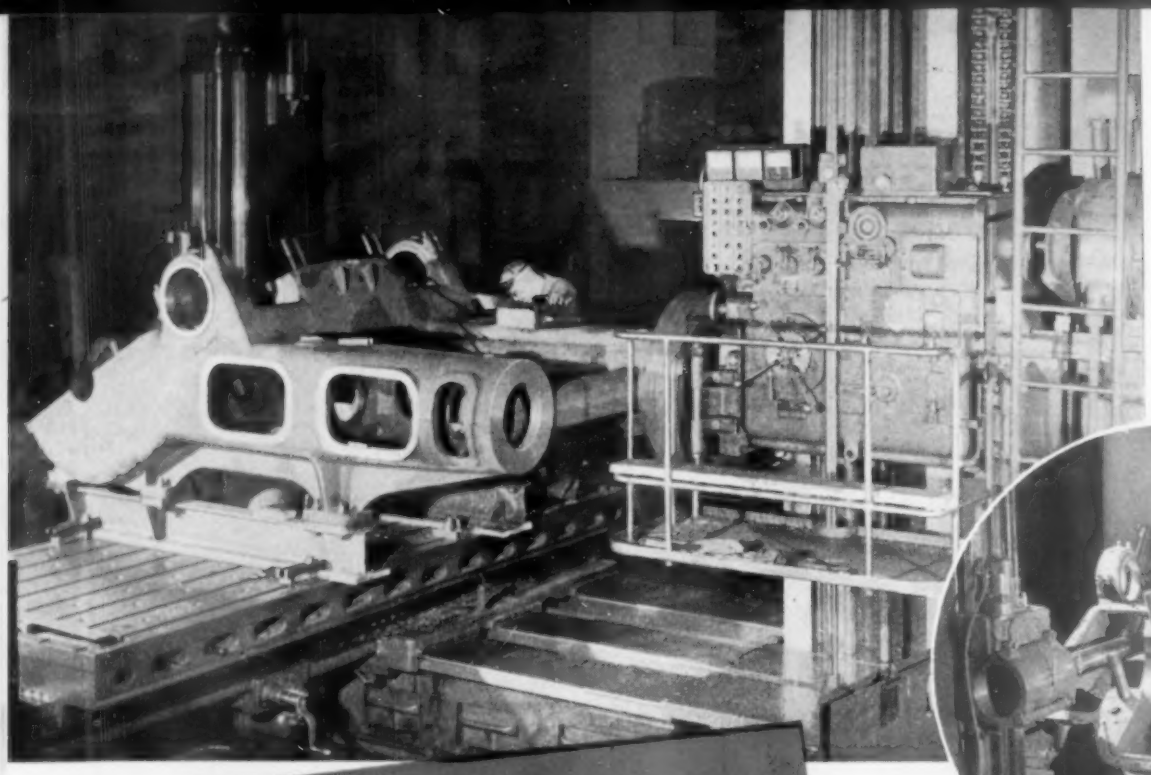
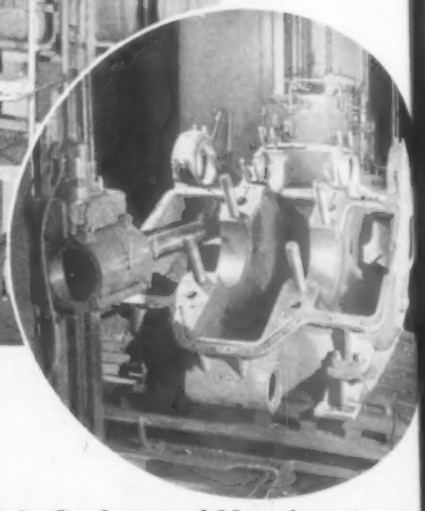
Subsidiary of Kearney & Trecker Corporation



Pump body mounted on parallels and clamped to machine table. Note remote control panel which enables operator to watch internal boring operations.

View of pump body showing boring bar extending through cross head bore. Angular cover surface, bolt holes and pinion and crank bearings have been machined.



HOW TO ELIMINATE LAYOUT WORK

and complete all operations on one machine

G.&.L. Scales and Verniers Locate All Dimensions . . . Milling, Boring, Drilling and Tapping are Performed in Five Simple Settings

● It is usual practice to depend upon G. & L. machines with scales and verniers to hold dimensions to .002″ on general work. This means that work can be taken directly to the machine without first laying out surfaces to be milled, holes to be drilled and center distances to be maintained.

On this pump frame, the following dimensions were held without layout—pinion to crank 35.250/35.248—cross head to cross head 39.000 plus or minus .002—crank bore 19.748/19.746—pinion two bores 12.123/12.121 and 13.998/13.996—cross head bores 17.000 plus .002 minus .000. The scales and verniers regularly furnished with the machine were depended upon entirely to align all bores, drill all holes and mill all surfaces.

This is a typical example showing how a G. & L. Horizontal Boring, Drilling and Milling Machine is used to completely machine a workpiece. From the time the pump body feet were machined to the time the part was completed, it did not leave the horizontal boring mill. All milling, facing, boring, drilling, tapping, recessing, back-facing and counterboring was done on one machine. It was necessary, of course, to change the position of the work in order to perform successive operations. The entire assembly was manually indexed with stop blocks and pins against parallels.

A Continuous Feed Facing Head was used to face and back-face the cross head ends. A remote control panel enables the operator to leave his position on the operating platform and control the machine as he watches the operation at the cutting tool.

If you are spending valuable man hours in laying out similar work in your own plant, it is possible the G. & L. Horizontal Boring Mill can eliminate this costly operation for you. Our engineers will be glad to study your machining problem and advise where savings can be made. There is no obligation for this service.

Additional Data

. . . covering the complete line of Giddings & Lewis machines and time-saving accessories is included in this catalog. Write for your copy today—please indicate your business connection. Ask for Bulletin TE-124.

GIDDINGS & LEWIS MACHINE TOOL CO.

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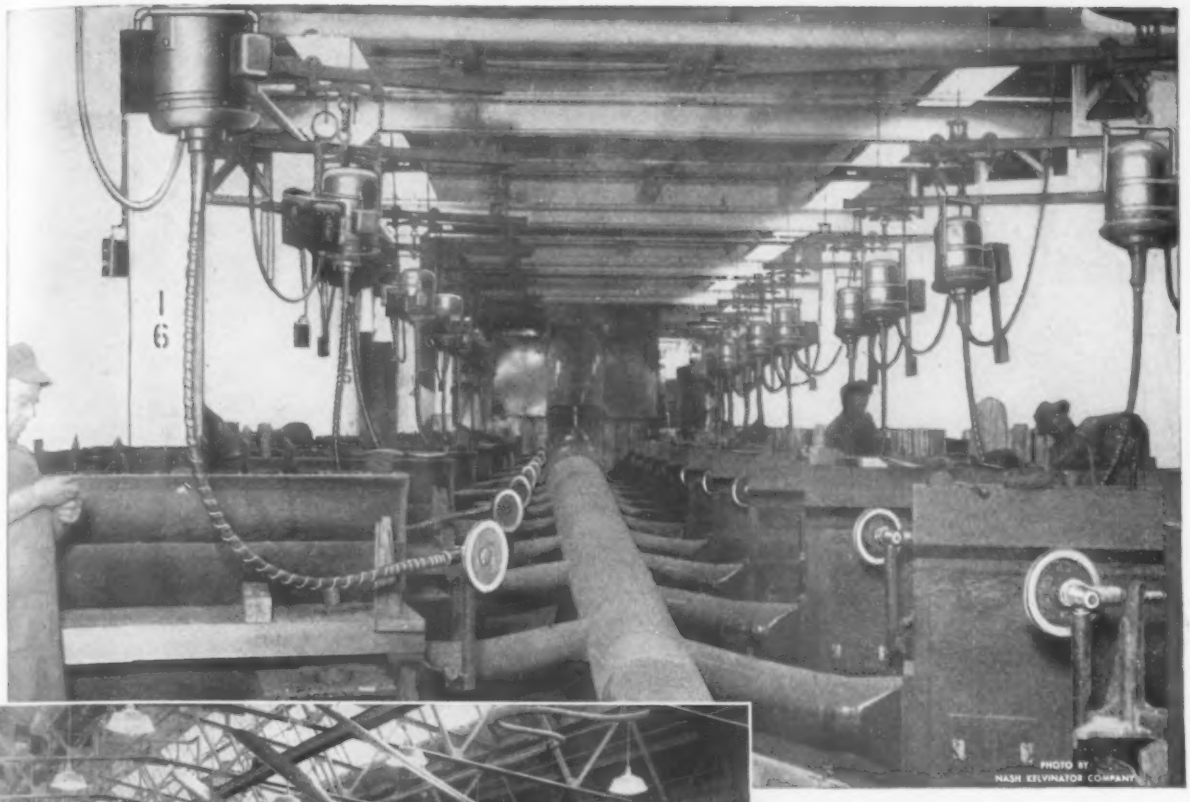

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TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES

New

New

MODEL JA

50,000 R.P.M.

$29.75 in U.S.A.

NOTE:—Higher speeds at higher prices are available if supporting engineering data are submitted. Higher speeds are not recommended unless properly supervised.

Weight 12 ounces; Length 6¾ inches; Chuck Size ⅛ inch. Wheel Guard Removed for Better Illustration

KIPP

Featherweight

AIR GRINDER

The Model JA is new in design both inside and outside. In it are utilized fewer parts, and they are made of Magnesium and Aluminum for extreme featherweight lightness. The alloy steel shaft diameter is unusually large for sustained smooth and true operation. This means still longer wheel life and better grinding. The speed, as before, is governed at 50,000 R.P.M. and there are selected ball bearings, front and rear. The JA Featherweight is a distinct improvement over all models previously produced by Madison-Kipp, the originators of really high speed grinders.

The same low price, $29.75 in U.S.A., remains. It is a post-war design for which materials have been released early. The pre-announcement output was geared to expected demand. Deliveries will be made out of stock as long as possible.

by

MADISON-KIPP

MADISON-KIPP CORPORATION, 209 Waubesa St., Madison 4, Wis., U. S. A.

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1. **No belts to shift. Drives to large step of cone at all speeds.**
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For turret lathes, shapers, milling machines, lathes, radial drills, boring mills, hobbing machines, Brown & Sharpe and Cleveland Automatic Screw Machines and other tools.

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SKF Industries
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The Todd Company
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Wagner Electric Co.
Worthington Pump Co.

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THE TURNER UNI-DRIVE COMPANY
(Sales Division: Turner Machinery Co.)
3416 Terrace St. Kansas City 8, Mo.

PRODUCING MACHINE TOOL DRIVES • ORDNANCE TOOLS • AIRCRAFT FITTINGS

Severance new tool craftsmen regrind worn tools with the same precise skill they use in making new tools. They give each flute the pitch and depth required to eliminate chatter. They carefully grind each tooth so your renewed tools take deep sharp bites like a new Severance Cutter. Each tool is given the Severite heat treat process that increases tooth hardness and lengthens cutting life 3 to 5 times. It will pay you to send your worn and dull cutters (hand ground, mill or chisel cut) to Severance for a factory regrind job.

Severance

Midget Milling Cutters • Precision Regrinding

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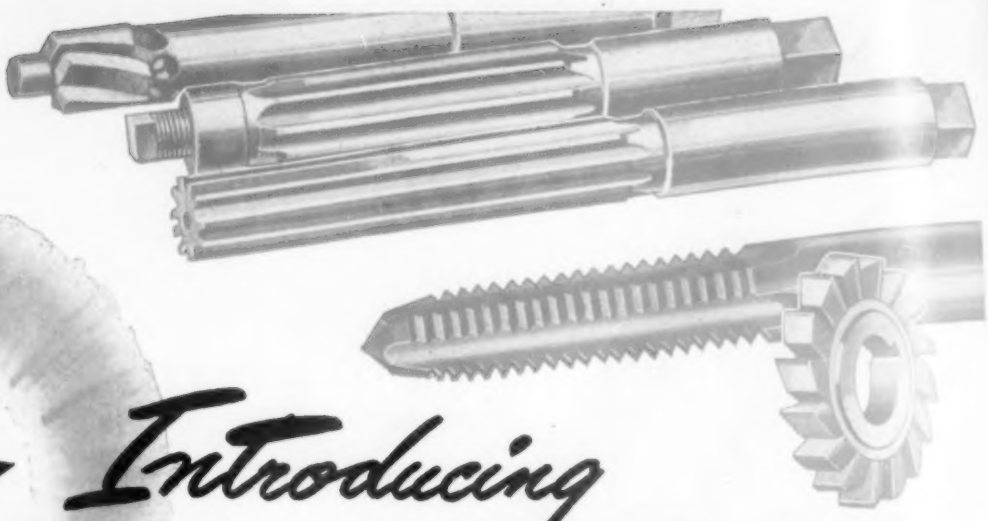


MO

Introducing

STAR-MO M-2

TUNGSTEN-MOLYBDENUM HIGH-SPEED STEEL

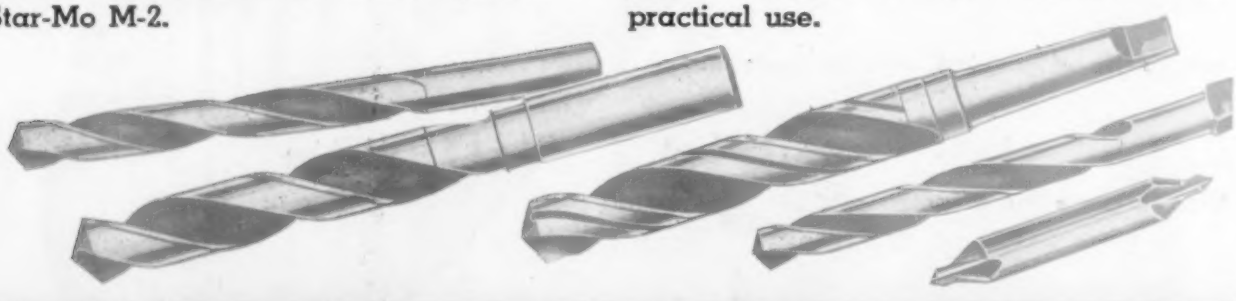
(M-2 ANALYSIS)

During the period of WPB control, Star-Mo high-speed steel conformed to Government requirements, but immediately upon removal of restrictions, late in 1943, an analysis was adopted by Firth-Sterling which was known as "M-2." Since then, all Star-Mo made has been of this new composition approved by leading automotive manufacturers and well-known tool makers. They also adopted the designation "M-2" to describe this type and we included it in the name for this new product —Star-Mo M-2.

STAR-MO M-2 is ***Better.*** On many applications it outcuts and outlasts 18-4-1 high-speed steel—a trial will prove it.

STAR-MO M-2 is ***Cheaper.*** The base price is 14% less than 18-4-1 steels, and in addition Star-Mo M-2 weighs approximately 7% less per foot. May we quote comparative prices?

STAR-MO M-2—is ***Easy to Handle.*** A Firth-Sterling representative will gladly tell you of its value on applications in your plant, methods of heat treatment, and practical use.



ARMY E NAVY

Firth-Sterling

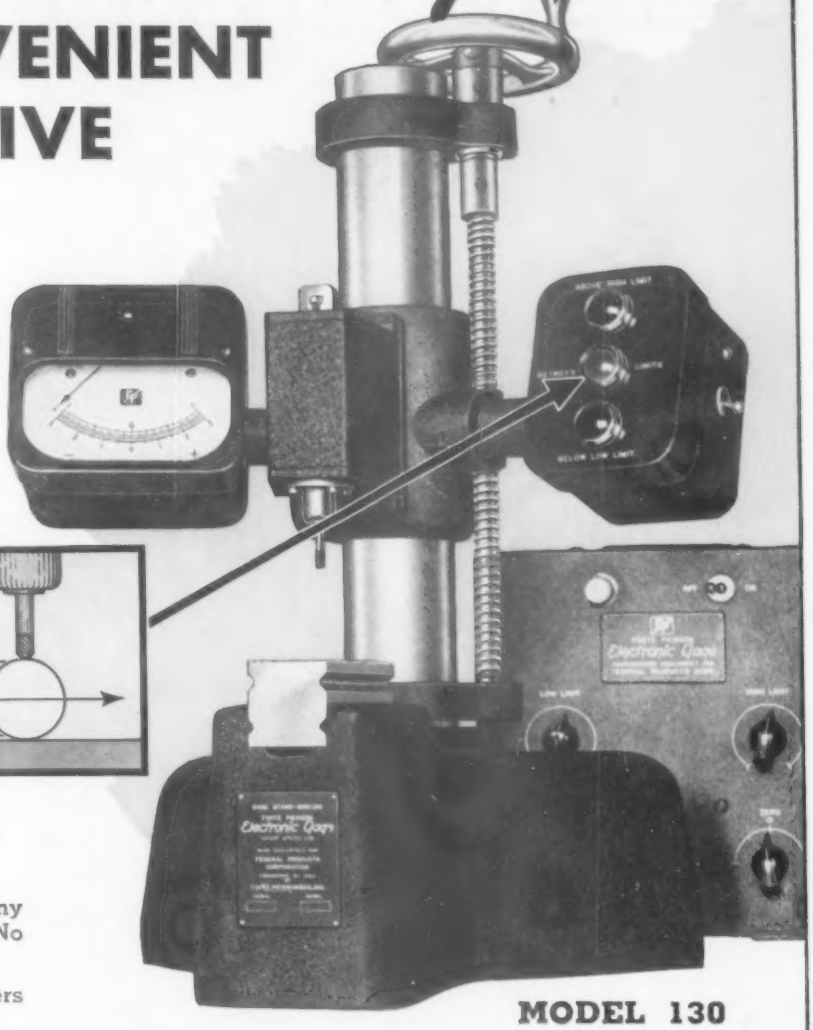
STEEL COMPANY

OFFICES: McKEESPORT, PA. • NEW YORK • HARTFORD • LOS ANGELES • CLEVELAND • CHICAGO • PHILADELPHIA • PITTSBURGH • DAYTON • DETROIT

Now FEDERAL brings you

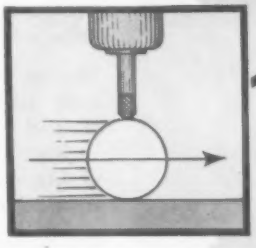
more CONVENIENT and SENSITIVE

GAGING by ELECTRONICS



ONE-PASS INSPECTION

Workpiece is passed *directly* under contact. No stopping and no backstop required. 30 to 60% faster inspection, accurately.



MODEL 130

OUTSTANDING BECAUSE–

Limit lights show immediately any variation in specified dimension. No hesitation, no backstop, positive.

No maximum and minimum masters required to set dimension limits.

Unusual wide-range zero adjustment makes setup simpler, faster and more positive.

Contact pressure adjustable from 2 to 16 ozs.

Four magnifications enable readings from ten microinch to .003". Even finer readings can be estimated.

This Comparator is of great value for fast, 100% inspection at either Production or Final Inspection. The speed is unusual. There is no necessity for slowly maneuvering the workpiece under the sensitive contact to determine its maximum dimension, nor to bring it to rest against a backstop. Actual time studies indicate savings in inspection time of from 40% to 60%.

Either tolerance lights or the meter scale may be used—the lights for fast, 100% inspection; the scale for selective inspection. The indicating hand swings positively and stops definitely and quickly.

This exceptional Comparator is a decided advance in gaging devices. Its flexibility, range, sensitivity and accuracy are worth investigation.

FOOTE PIERSON
Electronic Gage
MANUFACTURED EXCLUSIVELY FOR

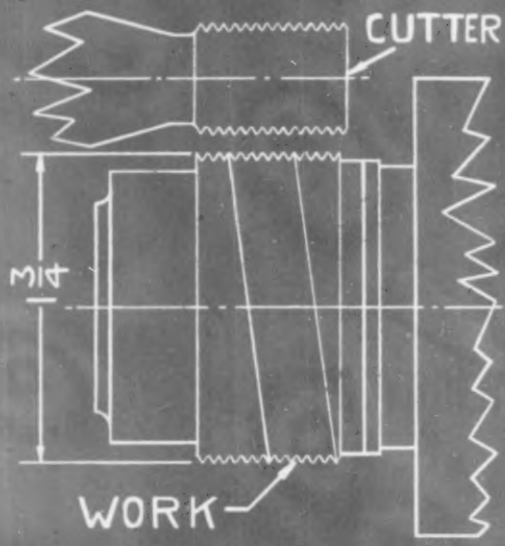
FEDERAL PRODUCTS CORPORATION • 1144 Eddy St., Providence 1 R. I.

★ ★ ★ ★ ★ **FEDERAL** ★ ★ ★ ★ ★

PRECISION MEASURING INSTRUMENTS

PLAN-O-MILL

Does it . . . with TWICE *the Speed—* HALF *the Manpower*



16 PITCH
.375 LEAD

We've said it before. We say it again. Obsolete machines are wasteful.

Notice the relatively small, solid, low-cost cutter used to mill this external thread. Plan-O-Mill rapidly and accurately mills this sextuple thread in a single revolution of the milling cutter around the work!

For thread milling, for cylindrical forming—internal or external—Plan-O-Mill delivers outstanding accuracy, superior finish, and most profitable production. One operator handles two or more Plan-O-Mills.

Replace those obsolete machines with Plan-O-Mills! Contact your machinery dealer or write direct.

"FIRSTS" WITH PLAN-O-MILL

First to install General Electric's remarkable new Thy-mo-trol electronic feed control!

First planetary to mill external threads with standard multiple thread cutter!

First planetary to coordinate feeds and speeds!

First to provide absolute control of feed-in!

PLAN-O-MILL
CORPORATION

1511 East Eight Mile Road • Hazel Park, Michigan

2¾% Nickel Steel locomotive rods, one bent cold to show ductility.

QUENCHED AND TEMPERED

NICKEL STEEL

FORGINGS COMBINE

EXCEPTIONAL DUCTILITY WITH HIGH TENSILE STRENGTH

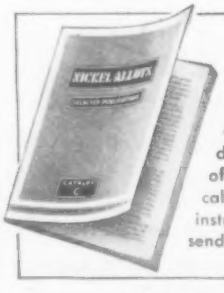
Composition and Typical Properties of Normalized Quenched and Tempered 2¾% Nickel Steel Rods

Description or Size	Melt Yield Pt. No. #s per Sq. In.	Tensile Strength #s per Sq. In.	Elong. % in 2 In.	Reduction in Area %	ANALYSIS					
					Car.	Mang.	Phos.	Sul.	Sil.	Ni
Main Rod....	92900	110000	25.0	64.4	.31	.78	.027	.026	.25	2.75
Main Rod....	86500	104500	25.5	65.6	.32	.86	.034	.032	.29	2.69
Main Rod....	86360	104400	26.0	64.8	.32	.86	.034	.032	.29	2.69
Main Rod....	87850	102350	26.0	66.2	.31	.89	.037	.025	.32	2.69
Front Rod....	86000	102250	25.0	67.3	.29	.82	.035	.027	.24	2.71
Front Rod....	83900	104250	25.0	66.1	.29	.82	.035	.027	.24	2.71
Front Rod....	86850	104250	27.0	66.1	.32	.86	.035	.025	.30	2.65
Front Rod....	89500	107050	25.5	65.6	.32	.86	.035	.025	.30	2.65
Back Rod....	89500	107650	25.0	62.7	.30	.79	.030	.025	.22	2.71
Back Rod....	87500	106450	25.0	65.4	.29	.82	.035	.027	.24	2.71
Back Rod....	87000	105600	25.0	65.4	.29	.82	.035	.027	.24	2.71
Back Rod....	88150	104850	26.0	66.8	.29	.82	.035	.027	.24	2.71

Specimens Taken from Mid-Section of Prolongations of the Forgings

The above table compiled by the American Locomotive Company shows the chemical compositions and mechanical properties of some normalized, quenched and tempered nickel steel front, main and back rods recently produced as replacement rods for locomotives being speeded up and rebalanced. These values are typical of replacement rod forgings recently tested by that company.

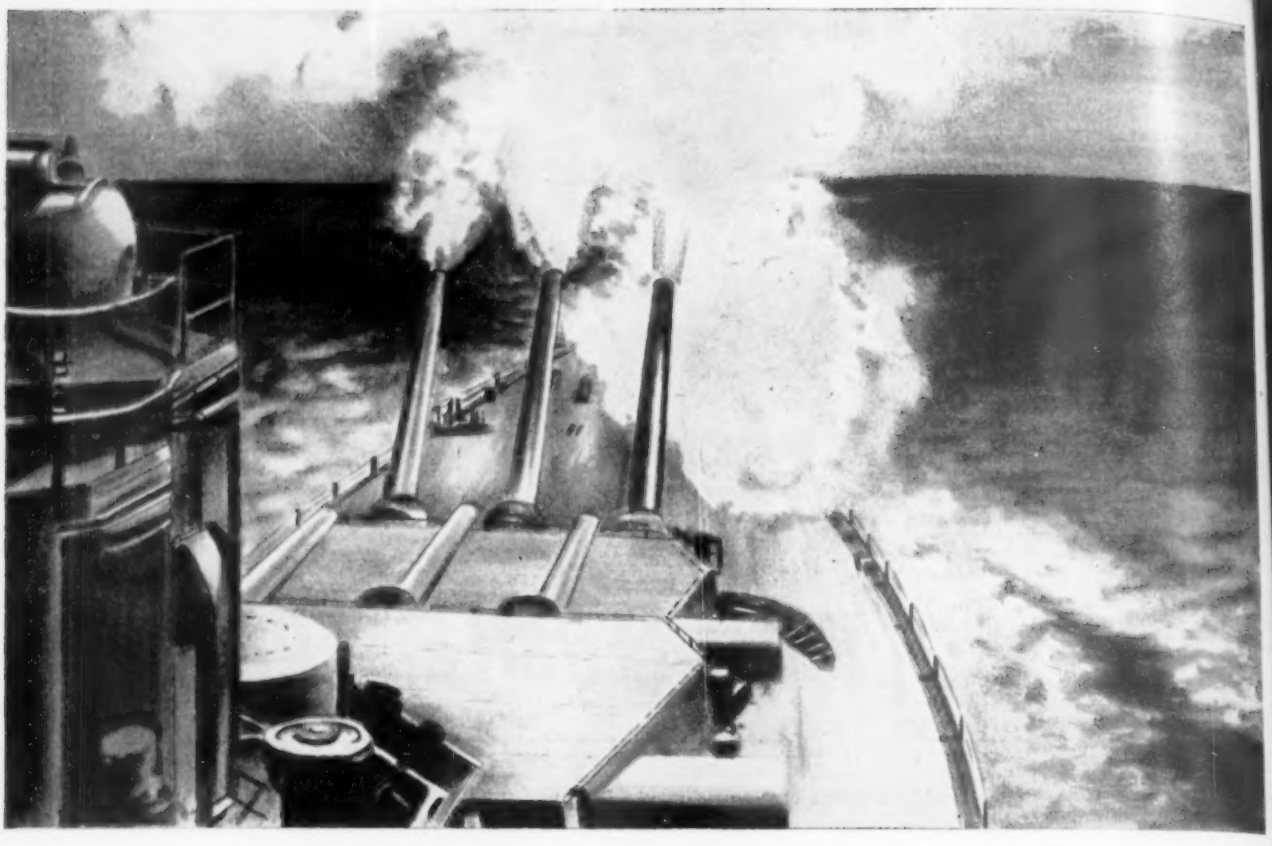
Quenched and tempered nickel steel forgings provide high tensile strength and ductility, combined with unusual toughness and high fatigue strength—qualities which tend to obviate breakage and assure long, trouble-free service when employed in heavy duty machinery and equipment.



Catalog "C" makes it easy for you to get booklets and bulletins on industrial applications of Nickel, metallurgical data and working instructions. Why not send for your copy today?

★ Nickel ★

THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall Street, New York 5, N. Y.*



For Blasting a "Tin Can" Beyond The Horizon

Microhoning Provides Vital Precision Bearings in Wartime Production

A battleship gun turret is a complex precision instrument on a gigantic scale. Each complete turret weighs about 1550 tons. This great mass must not only move smoothly, but also very rapidly —guns must be quickly targeted with extreme precision and without backlash. That calls for something extraordinary in the way of bearings.

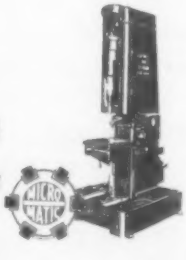
They must be dependable and have amazing accuracy. Inaccuracy or the slightest imperfection of operating fit would destroy the telescope precision needed to make each shot count.

The best ordinary machining methods won't provide the precision nor the fine surface finish necessary for accurate frictionless operation.

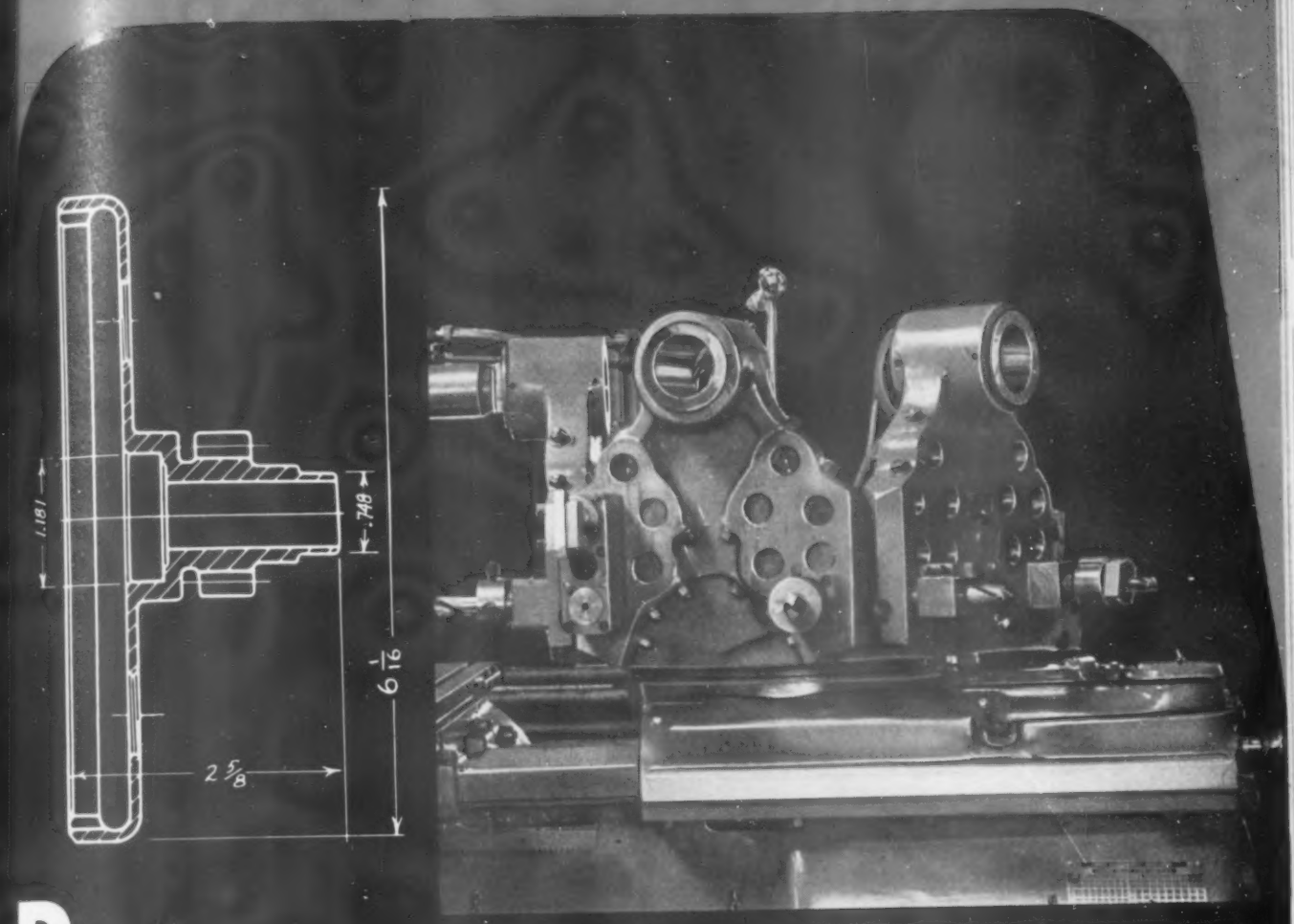
Microhoning was found to be the answer. Microhoning is a process of final machining which generates average bore accuracy for roundness and straightness within .0002" to .0003"—which removes up to 65 cubic inches of stock per hour. In production of turret bearings—not only for battleships, but also for cruisers and destroyers—Microhoning has provided the desired combined precision and finish.

And, it will be more constructively useful in coming times of peace than it has been in war production.

MICROMATIC
HONE CORPORATION
DETROIT 4, MICHIGAN



MAKERS OF HONING MACHINE TOOLS



RE-TOOLING *by* P&J PROTECTS YOUR ORIGINAL INVESTMENT *in* LOW COST PRODUCTION

...Originally tooled for gear blanks

...e P&J 5-D-2 (two spindle) 12" Automatic provides the means of han-...ing either two identical operations simultaneously or two entirely dif-...rent operations. Set-up for rough and finish machining the gear blank ...strated, this machine demonstrated its high efficiency and produc-...n with an exceptional degree of accuracy.

...but with re-tooling possibilities for ...ther work

...wners of P&J Automatic Chucking Equipment made a wise investment in their or-...al purchase of P&J equipment. They bought not only the special tooling they ...eded for a specific job (such as the one illustrated here) but also the *tooling pos-...ibilities* for other work. By the comparatively simple procedure of re-tooling, their ...&J machines may be converted to handle other jobs and other operations, but with ... inherent conveniences, efficiencies and accuracy of original machines maintained ...act.

...r investment in RE-TOOLING will enable you to handle future work economically ...d derive further worthwhile returns from your investment in P&J equipment. Our ...gineers and the facilities of our shop are at your service.

P & J

Rebuilding Service

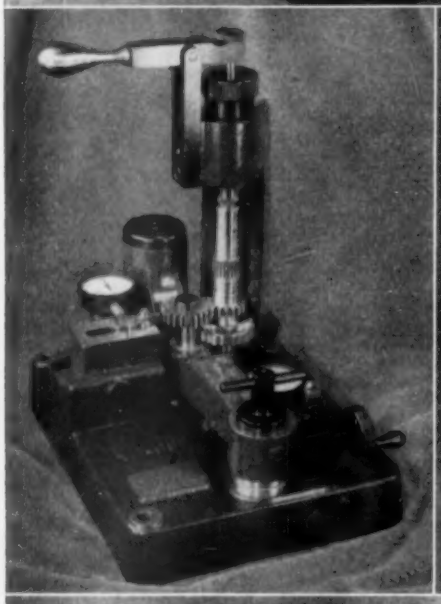
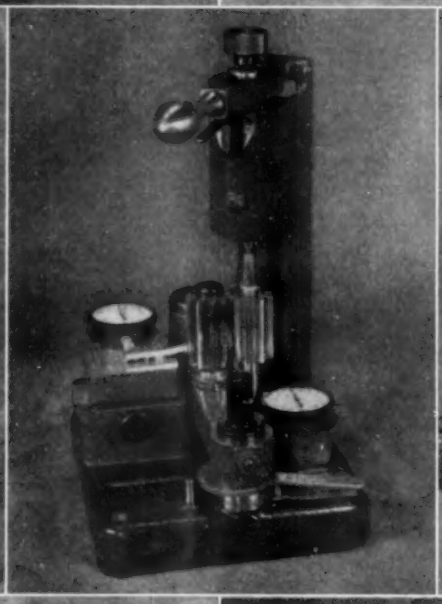
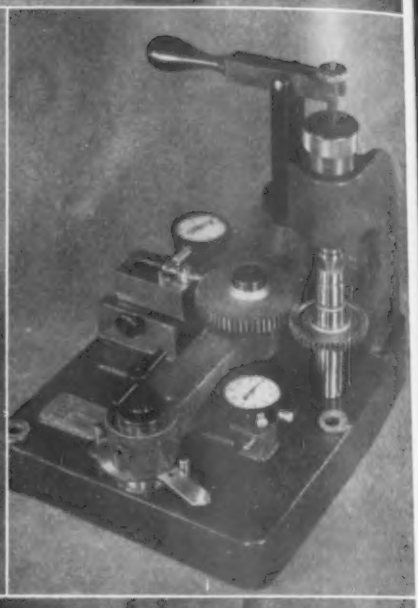
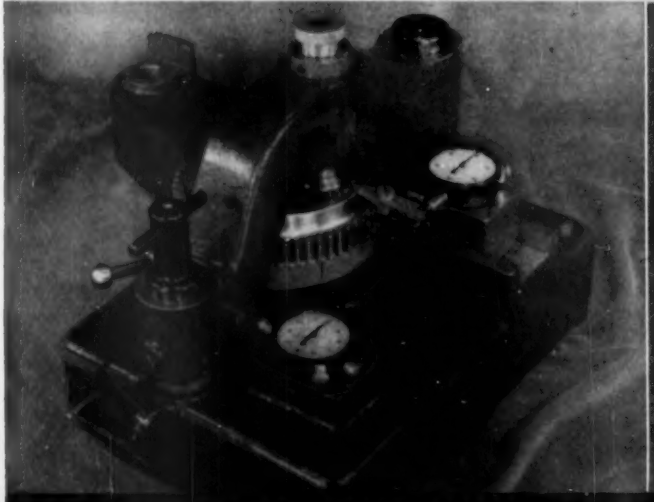
Restoration of present P&J machines to their original accuracy and productivity through rebuilding in our plant is available to owners of P&J equipment. Re-tooling can be handled also at the same time, if desired. Investigate.

BUY BONDS *and* SAVE LIVES

...OTTER & JOHNSTON MACH. CO., *Pawtucket, R. I.*

VINCO GEAR ROLLING FIXTURES *with* MASTER GEARS

. . . a positive check for backlash and run-out.

VINCO CORPORATION, 8857 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN, SALES OFFICES, NEW YORK, CHICAGO, CLEVELAND

MILLIONTHS OF AN INCH FOR SALE BY VINCO

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development.

. . . *it is later than you think!*

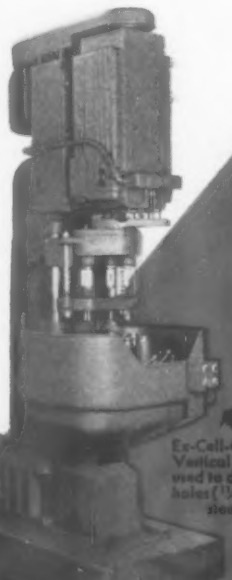
Plan *Now* to EX-CELL-O*ize* for Tomorrow's Production Needs

NOW is the time to prepare for needs immediately ahead . . . for tomorrow's keener competition that will make more efficient production methods essential. Your production problems may readily be solved by special-purpose machines that perform multiple operations . . . machines designed and built to meet your specific requirements. Ex-Cell-O has had many years of practical experience in *precision engineering* special-purpose machines that combine improved accuracy and finish with greater production and worthwhile economy. Get in touch *today* with Ex-Cell-O at Detroit or with any of its field engineers in 32 other industrial centers both in the United States and Canada.

EX-CELL-O CORPORATION
DETROIT 6

Special Ex-Cell-O Machine to mill four grooves in aluminum alloy pistons

Special Ex-Cell-O three-way machine to drill 40 holes in body of alloy steel sleeve



Ex-Cell-O Style 45 Vertical Drill Press used to drill and ream holes (11/16) in stainless steel flange

Ex-Cell-O Style 61 Cylinder Boring Machine, used to finish bore connecting rods

PART: *Aircraft motor accessories drive housing*

MATERIAL: *Magnesium*

OPERATION: *Finish bore and face five periphery holes*

MACHINE: *Ex-Cell-O No. 61 Cylinder Boring Machine*

One Ex-Cell-O machine now does the work on this part where previously four other machines were required. The big saving in machines, fixtures, operators and floor space is readily apparent.

1919 XLO 1944

Where increased production, high accuracy, and greater economy through multiple operations are required . . . consult EX-CELL-O.

EX-CELL-O *makes:*

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES

SPECIAL MULTIPLE PRECISION DRILLING MACHINES

PRECISION BORING, TURNING AND FACING MACHINES, AND FIXTURES

PRECISION CYLINDER BORING MACHINES

PRECISION THREAD GRINDING MACHINES

PRECISION LAPPING MACHINES

PRECISION BROACH SHARPENING MACHINES

OTHER SPECIAL PURPOSE MACHINES

BROACHES AND BROACH FIXTURES

HYDRAULIC POWER UNITS

GRINDING SPINDLES

DRILL JIG BUSHINGS

CONTINENTAL CUTTING TOOLS

TOOL GRINDERS

FUEL INJECTION EQUIPMENT

R. R. PINS AND BUSHINGS

PURE-PAK PAPER MILK BOTTLE MACHINES

PRECISION AIRCRAFT AND MISCELLANEOUS PARTS

BULLETIN 11-A
BRAZING
CARBIDE TOOL TIPS
WITH
EASY-FLO No. 3
Brazing cemented carbide tips to tool shanks with EASY-FLO No. 3 is not new. It is the accepted, time-tested way of doing the job and is widely recommended by leading cemented carbide tip manufacturers. Use it confidently for tipping all tools except those on which excessive cutting heat is generated.
WHY EASY-FLO No. 3 IS FAVORED FOR CARBIDE TIPPING
1. Its low working temperature of 1270
the danger of overheating the tool shank
tip oxidation low.
2. Its free-flowing property helps assu
"wetting" of joint surfaces.
3. When properly applied, it make
hold for the life of the tool — the tip u
before the braze.
4. It is economical as well as fast,
temperature and easy flowing minimiz
and costs.
5. It permits ready removal of u
vage and re-use of shanks.
Send for this
"HOW TO" bulletin
on Tool Tipping
In simple, concise form, this new bulletin covers the widely accepted EASY-FLO No. 3 method of mounting carbide tool tips.
It explains why brazing with the low temperature silver alloy EASY-FLO No. 3 is so fast, reliable and economical.
It gives a step-by-step "picture and word" explanation of how to do a tool tipping job that is clear and easy to follow.
The bulletin also covers the procedure for mounting high speed steel tips with the regular EASY-FLO alloy.
If you are in any way interested in tool tipping, you should have the valuable information offered in BULLETIN 11-A. We'll be glad to send you a copy on request. Write for it—today.
ARMY
NAVY
HANDY & HARMAN
82 FULTON ST., NEW YORK 7, N. Y.
Bridgeport, Conn. • Chicago, Ill. • Los Angeles, Cal. • Providence, R. I. • Toronto, Canada
Agents in Principal Cities

"By making sure cutting speeds and feeds are correct, milling cutter life can be doubled"

says LEWIS SKEEL, Chief Engineer
McCROSKY TOOL CORP.
Meadville, Penna.

"A great percentage of all cutter failures may be traced directly to incorrect cutting speeds. Although no fixed rules can be given, due to the variety of operating conditions, the following general recommendations will be helpful in determining the correct cutting speed.

"The peripheral speed of the cutter should be reduced as the hardness of the material being milled increases. When milling a specific material, it is found that as the speed of the cutter is increased, heat is generated faster than it can be conducted away. This results in softening of the cutting edge of the cutter teeth, increased abrasion and eventual breakdown if the action is allowed to continue.

"The speeds given in Table 1 can be successfully used for properly designed high-speed steel milling cutters. The figures are conservative and represent average practice on production jobs. Cutting speeds for fine-finish milling may be increased as much as 50% over the recommended speeds for rough milling.

"The maximum feed rate which can be used satisfactorily for any job is limited to the lowest rate determined from the following requirements . . . The feed must not be so high as to: (1) Load the machine beyond its rated horsepower, (2) Produce an excessive load on the teeth of the cutter (for any given material or depth of cut, this load is determined by the feed per tooth), (3) Impair the finish by having the 'revolution marks' too widely spaced (this spacing is determined by the feed per revolution). Table 2 lists the permissible feed per tooth, based on average conditions for high-speed steel cutters when milling various types of materials."

Care in the selection of the correct cutting oil is as important as the selection of the correct cutting speeds and feeds for milling cutters. That's why Shell Lubrication Engineers have developed a control technique that "balances" the oil to the machine, the application, and the tool. Ask the Shell man for the details.

SHELL CUTTING OILS
FOR METAL CUTTING AND GRINDING

TABLE I

CUTTING SPEEDS FOR HIGH-SPEED STEEL MILLING CUTTERS

WORK MATERIAL	CUTTING SPEED (ft. per min.)
Alloy Steel—Hard (300-360 Brinell)	20-28
Alloy Tool Steel (250-300 Brinell)	28-40
Alloy Steel—Tough, Cast Steel	40-52
Alloy Steel—Medium, Cast Iron—Hard	52-65
SAE 1045 Steel, Malleable Iron	65-79
SAE 1020 and X-1335 Steel, Cast Iron—Medium	79-97
SAE X-1112 Steel, Cast Iron—Soft	97-125
Brass and Bronze—Medium	125-180
Brass and Bronze—Soft	180-280
Aluminum and Other Light Alloys	280-1500

To convert the cutting speeds in feet per minute to R.P.M., use the following formula—

$$r.p.m. = \frac{\text{cutting speed (ft. per min.)} \times 3.82}{\text{cutter diameter in inches}}$$

TABLE II

PERMISSIBLE FEED PER TOOTH FOR HIGH-SPEED STEEL MILLING CUTTERS

WORK MATERIAL	FEED PER TOOTH		
	Mills Face	Side Mills Slotting and	Mills End
Aluminum, Soft Bronze	.022	.013	.011
Medium Bronze, Cast Iron—Soft	.018	.011	.009
Malleable Iron, Cast Iron—Medium	.015	.009	.008
SAE X-1112 Steel, Cast Iron—Hard	.013	.008	.006
SAE 1020 Steel, SAE X-1335 Steel	.011	.007	.005
SAE 1045 Steel, Cast Steel	.009	.006	.005
Alloy Steel—Medium	.008	.005	.004
Alloy Steel—Tough	.007	.004	.004
Alloy Steel—250 to 300 Brinell	.006	.004	.003
Alloy Steel—Hard—300 to 360 Brinell	.005	.003	.003

The feed per tooth may be converted into feed in inches per minute by multiplying the feed per tooth by the number of teeth in the cutter and the revolutions per minute.

Above tables courtesy Cincinnati Milling Machine Company

SHELL

Deepfreeze Cascade −120° F. Industrial Chilling Machine designed for numerous high production cold treating operations.

GAUGE GROWTH ELIMINATED

AFTER *Cold Treating* IN A Deepfreeze Industrial Chilling Machine

"H" type pin gauges completely stabilized by cold treating.

In Addition, Gauge Life Lengthened as a Result of Increased Metal Hardness

Here is a typical example of how manufacturers are using cold treating to stabilize gauges and other precision machine parts. Under conventional production methods the "H" type pin gauges shown above grew as much as .001" to .0015" while stored in tool cribs. Now, after cold treating, at −120° F. in a Deepfreeze Industrial Chilling Machine before final machining, the gauges hold their original dimensions for indefinite periods of time. In addition, the increased hardness of the metal obtained in the same cold treatment resulted in improved wearing quality of the gauges.

COLD TREATING FACTS

MACHINE—Deepfreeze — 120° F. Industrial Chilling Machine.

PART—"H" type pin gauges.

GAUGE SIZES—3.000 4.330, 5.000, 6.250, 7.000.

MATERIAL—S.A.E. 1095 Carbon Tool Steel for gauging blocks; cross piece from cold rolled bars.

TREATING PROCEDURE—(1) Heat to 1450° F.; (2) water quenched; (3) immersed in water approximately 210° F. for 1½ hours; (4) return to room temperature; (5) transfer to Deepfreeze at — 120° F. for 1½ hours; (6) return to room temperature; (7) given a draw of 375° F. for 1½ hours; (8) cooled to room temperature; (9) return to Deepfreeze for 1½ hours; (10) return to room temperature; (11) immersed in hot water at 210° F. for 1½ hours; (12) return to room temperature; (13) again cold treated in Deepfreeze at — 120° F. for 1½ hours; (14) return to room temperature; (15) finished ground to size.

NOTE: Every effort was made to make the rise and fall of the temperature continuous without any prolonged rest between the hot and cold point reached.

RESULTS: These gauges were checked for size immediately after cold treatment, then four months later, and once again two months later. It was found that growth was held to a maximum of .00004" as compared to the previous growth of .0015."

How Others Are Using Cold Treating

Cold treating is being practically applied at present by numerous manufacturers of diversified products for the following purposes:

Treating of high-speed steel cutting tools.
Shrinking of metal.
Shrink-fit assembly.
Stabilization of gauges.
Hardening precision machine parts.
Testing of aircraft instruments and materials.
Testing of lubricants, paints, plastics, chemicals, synthetic rubber and pharmaceuticals.

FREE *Complete, Up-to-date Cold Treating Information...*

Our new 40-page booklet covers every phase of cold treating from its inception to the present time. It gives specific information on how such manufacturers as Curtiss-Wright Corporation, Cincinnati Milling Machine Company, Ford Motor Company, Savage Tool Company, Kearney & Trecker Corporation, and many other Deepfreeze users are applying cold treating to their production. Write today for Bulletin No. 1-4.

Only Motor Products can make a "DEEPFREEZE"

Deepfreeze

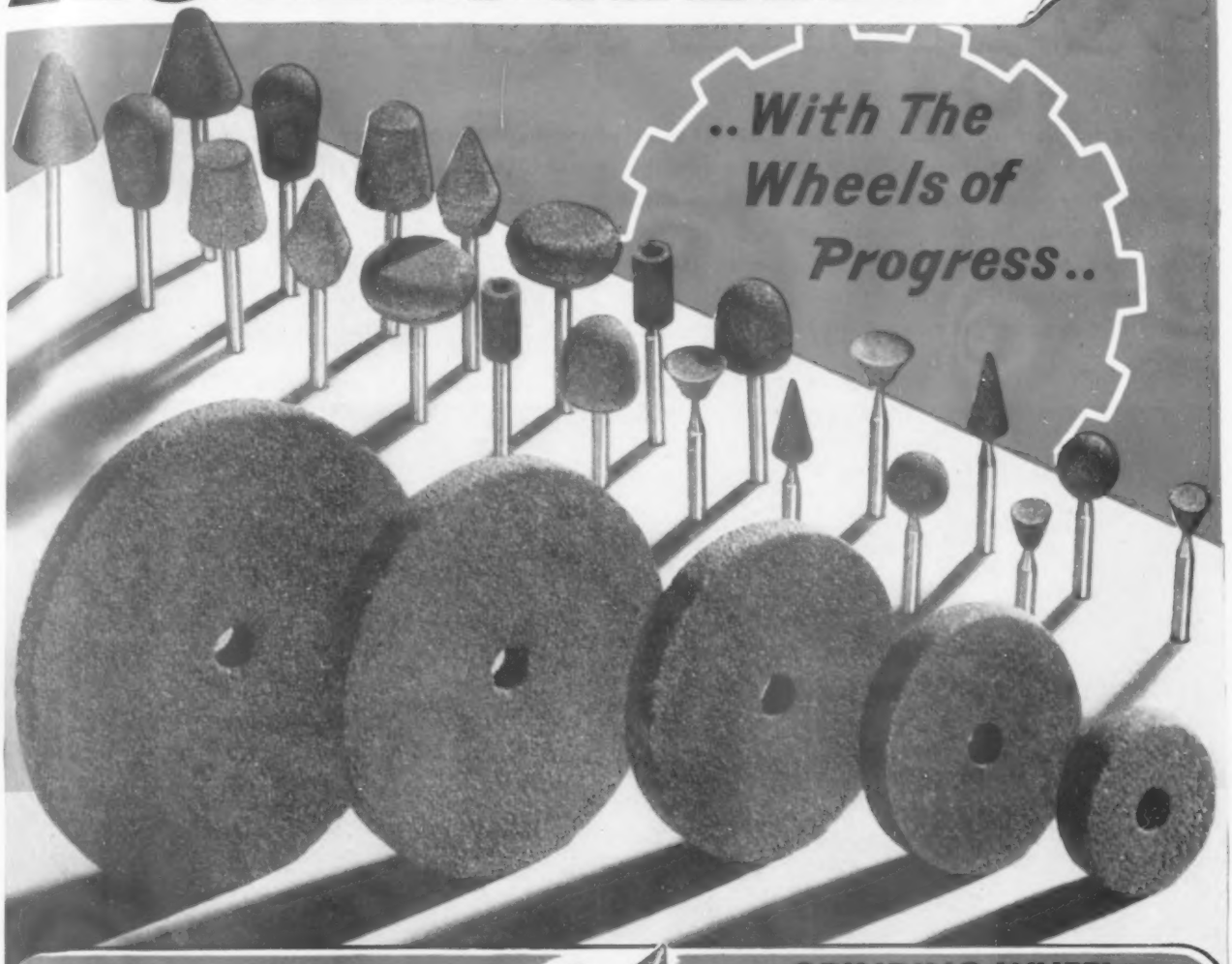
2311 DAVIS STREET
NORTH CHICAGO, ILLINOIS

TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE

dustrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

Division of Motor Products Corporation, Detroit, Michigan

FORWARD



CHICAGO GRINDING WHEELS AND MOUNTED WHEELS

● Geared to the precision demands of war, Chicago Wheels have been a potent force in smashing bottlenecks—cutting down rejects—speeding production to an all-time high.

Constantly tested, constantly improved—Chicago Wheels produce finishes so perfect they pass exacting surface analyzer tests, so accurate they can be measured in micro inches.

Production of civilian goods will demand the same precision finishing methods.

Keep pace with Chicagos, the Wheels of Progress!

CHICAGO GRINDING WHEELS

Anything up to 3" in diameter in various grains and bonds, including FV, the sensational new bond with a pedigree.

CHICAGO MOUNTED WHEELS

Shapes and abrasive formulas to take care of every job of internal or external finishing.

TRY ONE FREE!

So you'll know what they can do, we will send a test wheel. Tell us material you'd like to finish and size wheel required.

ARMY E NAVY
MOUNTED WHEELS
SMALL GRINDING WHEELS

CHICAGO WHEEL & MFG. CO.

Half a Century of Specialization has Established our Reputation as the Small Wheel People of the Abrasive Industry

1101 W. Monroe St., Dept. TE, Chicago 7, Ill.

Send Catalog. Interested in ☐ Grinding Wheels ☐ Mounted Wheels. TE-12

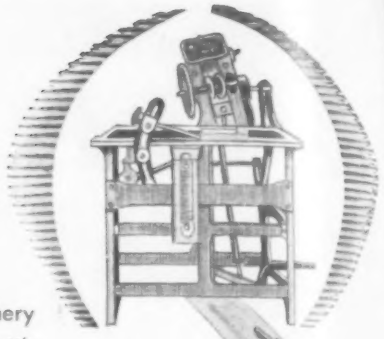
☐ Send Test Wheel. Size .....

Name .....

Address .....

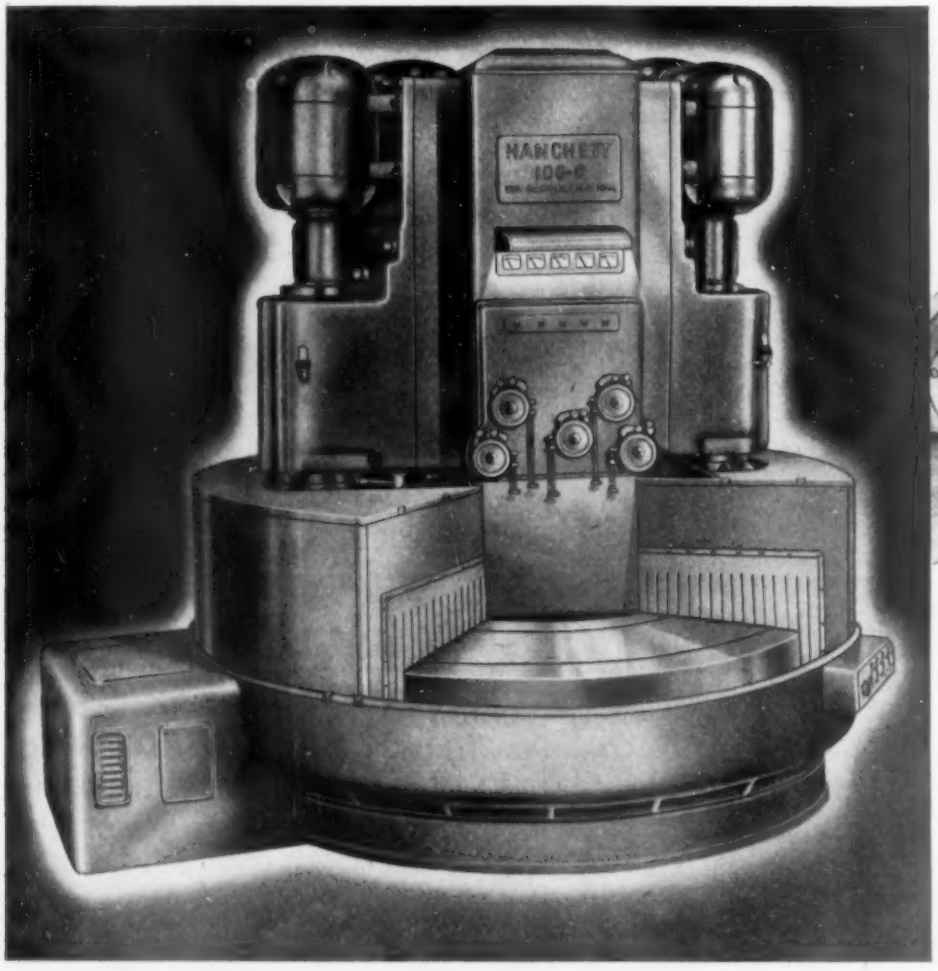
ALREADY "OF AGE"

50 YEARS AGO



1894

Back in '94, Hanchett was already "of age" — with 21 years' practical grinding machinery experience to its credit, and a fine reputation for precision products. Today, Hanchett's record of steady growth is recognized by the trade. For this company's advancements have always been a step ahead of the times—designed to meet both present and future production needs. Most recent is the new Hanchett No. 100 Rotary Surface Grinder—a high-speed, large-capacity, precision machine that takes five cuts (from roughing to finishing in one pass) with automatic worksize control. And this is only one of many.



1944

WRITE TODAY for BULLETIN No. 170 T-14

HANCHETT GRINDERS — BIG RAPIDS MICHIGAN

IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.
BIG RAPIDS, MICHIGAN U.S.A.

ANOTHER NEW SERVICE BY "CARBORUNDUM"

THE GRINDING WHEEL THAT SPEAKS FOR ITSELF!

MORE THAN A LABEL, THIS NEW BLOTTER TELLS THE WHOLE STORY AT A GLANCE!

From now on, it's going to be easier than ever to pick the right wheel for the job—all grinding wheels by "CARBORUNDUM" will carry this new wheel blotter . . . makes identification *quicker* and easier. A glance tells you why.

1 **Easier to use.** All the information you need is on one side of the blotter (see large picture opposite). And to make it even easier to pick the correct grading, it lists both the old wheel markings and the new markings.

2 **Easier to recognize.** The bright red color says it's a wheel by "CARBORUNDUM", clear across the shop! It's further identified by the display side of the blotter. (See picture below.) Even when the wheel is on the machine, and the blotter covered, the black mark on the margin identifies it as a product by "CARBORUNDUM".

3 **Easier to read.** The new blotter resists scuffing, and the heavily inked surface remains more legible, even when soiled with grime and grease.

Wheels with the new blotters will be shipped shortly. If you should receive a wheel with the old blotter, it just means that particular wheel was stocked before the new blotters were ready.

1 Bright red color . . . black mark . . . makes identification easier.

2 Information on one side . . . Both old and new markings included.

3 Large ink surface more legible even when dirty . . . resistant to scuffing.

MAIL COUPON TODAY if you haven't received your free copy of "GRINDING FACTS." It's the new book by "CARBORUNDUM" that explains all about the new wheel markings. It's also full of information on the selection, care and use of grinding wheels!

THERE IS A PRODUCT BY

CARBORUNDUM

TRADE MARK

FOR EVERY ABRASIVE APPLICATION

The Carborundum Company,
Niagara Falls, N. Y. Dept. TE-12.

Please send me my free copy of "GRINDING FACTS"

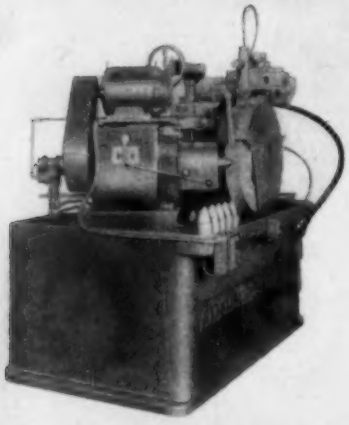
Name .....

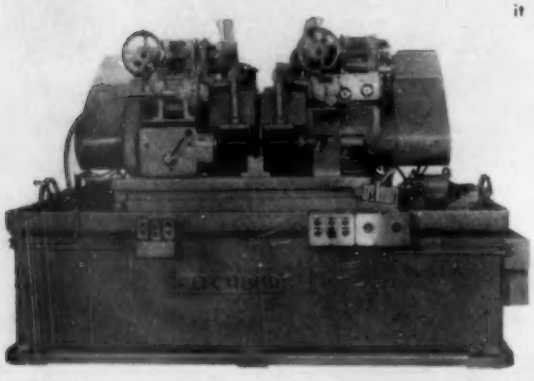
Firm ..... Title .....

Address .....

("CARBORUNDUM" and "ALOXITE" are registered trade marks of and indicate manufacture by The Carborundum Company)

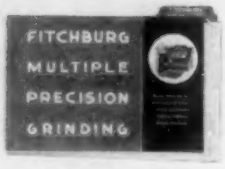
You can RECONVERT FITCHBURG GRINDERS





With reconversion ahead Fitchburg users should keep in mind all Fitchburg Bowgage Head Precision Grinding Wheelhead Units are standard and interchangeable.

If the grinding operations for which they were purchased are discontinued, the heads can be remounted on standard machines, or on new special bases, for operations other than the ones originally specified. This is particularly appreciated by those using Fitchburg Grinders for ordnance production.



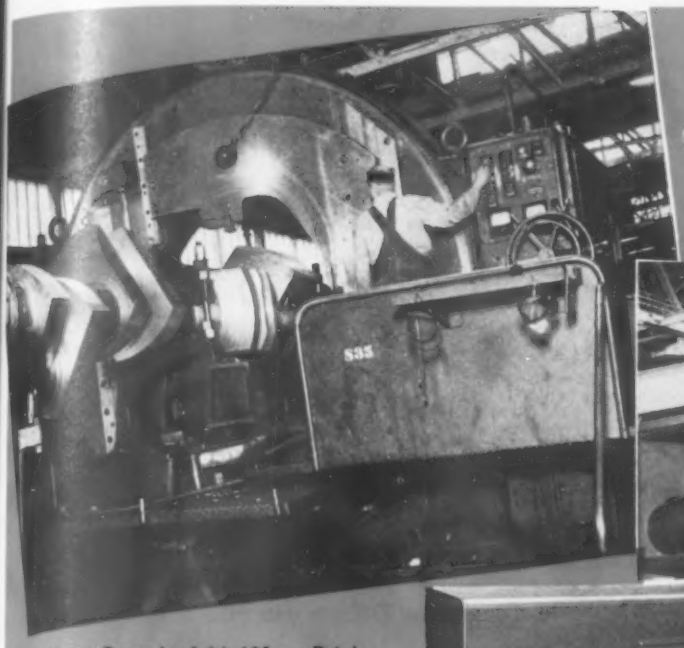
This book shows how to cut grinding costs . . . Sent free . . . write for it today.

This exclusive Fitchburg feature protects your investment, and we suggest that future buyers of special purpose grinders or plain cylindrical grinders first consult Fitchburg engineers. Write us today.

FITCHBURG GRINDING MACHINE CORP.

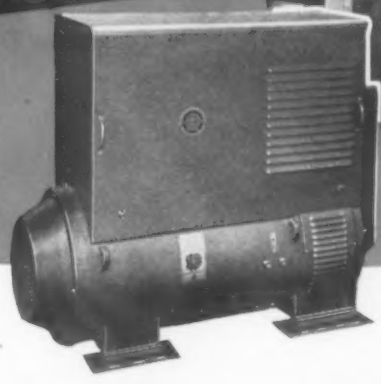
FITCHBURG, MASSACHUSETTS, U. S. A.

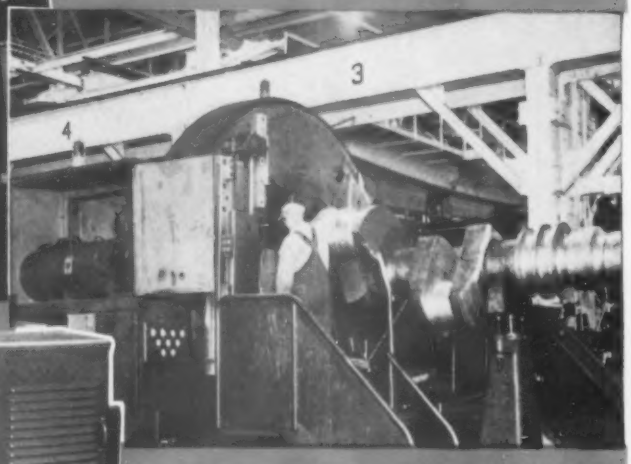
Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.



Above: Controls of this 125-ton Beloit Crankpin Turning Lathe are grouped within easy reach of operator.

As shown at right, Reliance V★S Drive is also available with a "packaged" control unit, to provide smooth speed changes over wide ranges.





Above: The built-in Reliance V★S Adjustable-speed Drive furnishes controlled power for all functions from A-c. circuit.

"MOTOR-DRIVE IS MORE THAN POWER"

GIANT LATHE OPERATES FROM A-C POWER LINES

With All Operations Electrically Controlled Through Reliance V★S Drive

In doing its job of machining the huge crankshafts for Diesel Engines, this 125-ton Beloit Crankpin Turning Lathe combines an exceptionally high rate of production with precision operation. This is due in no small measure to the use of Reliance V★S Drive.

All operations—starting, stopping, jogging, reversing, speed adjustments—are electrically controlled, using the plant's A-c. lines. All controls are within convenient reach of the operator. Both design and operation of the machine are greatly simplified.

This is but one example of the way in which, with Reliance V★S Adjustable-speed Drive, it is possible to centralize and simplify control of complicated production machines and operations. It is something you are likely to find worth talking over with a Reliance Application Engineer. Or write us at Cleveland for more information if that is more convenient.

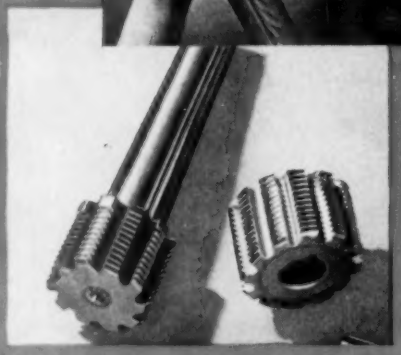
RELIANCE ELECTRIC & ENGINEERING CO.
1088 Ivanhoe Road • Cleveland 10, Ohio

Birmingham • Boston • Buffalo • Chicago • Cincinnati • Detroit • Greenville (S. C.) • Houston • Kalamazoo • Los Angeles • Minneapolis New York • Philadelphia • Pittsburgh • Portland (Ore.) • St. Louis • San Francisco • Syracuse • Washington, D.C. • and other principal cities.

RELIANCE A-C D-C MOTORS

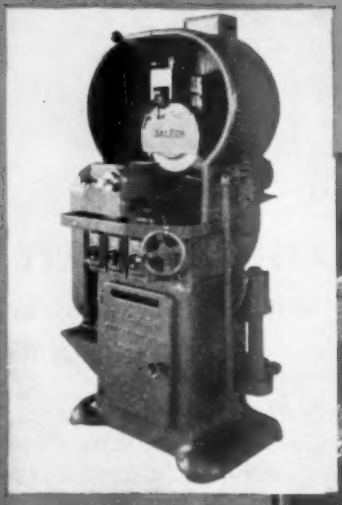
Do it with DALZEN

Left: Dalzen taps, in U. S., Metric, Whitworth, and Special forms are precision ground of hardened high speed steel in a complete size range. TUNGSTEN CARBIDE TAPS — EITHER SOLID OR INSERT—A SPECIALTY.



Left: High speed ground thread milling cutters, scientifically heat treated for longer cutting life.

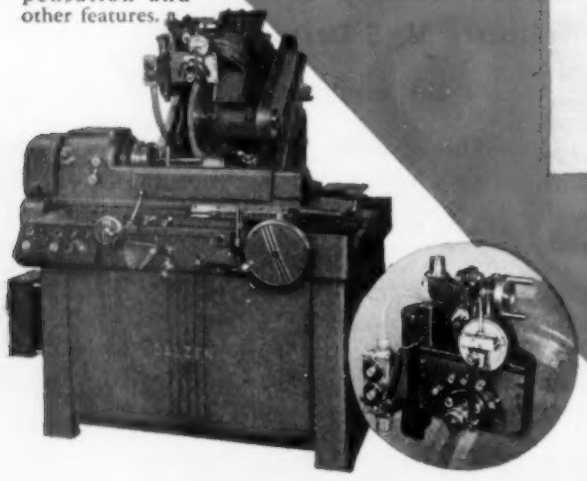
Dalzen manufactures an extensive line of precision cutting tools, parts, thread grinding and special machines — engineered for maximum efficiency and economical operation. Each is the result of years of experience on the part of designers and craftsmen. These are reasons why, all over the United States and in many foreign countries, master mechanics who have used and worked with Dalzen-made machines and tools say, "You can do it better with Dalzen." Write for details on how Dalzen can "do it better" for you.

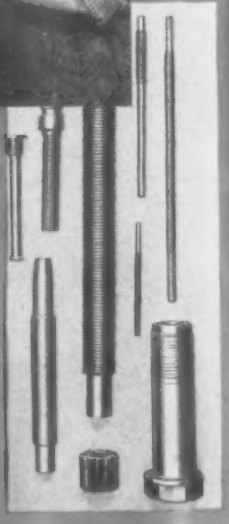


Below: Dalzen "2-in-1" combines a dependable, accurate center lapping machine with a sturdy drill press. Saves on equipment costs, floor space.

Below: No. 5 *Electronic* Thread Grinder. Easy to operate. High production efficiency and accuracy by controlled wheel speed, motor driven dresser, automatic compensation and other features.

Right: No. 2 Thread Grinder. Compact, upright design saves floor space. Simple to operate. Low first and maintenance cost. Ideal for short or production runs.





Right: Threaded parts are ground to close tolerances exactly to your specifications. Rigid inspection standards assure a uniform fine finish. Jobs requiring rolled or cut threads are also handled.

DALZEN

TOOL AND MANUFACTURING CO.

12255 EAST EIGHT MILE ROAD • DETROIT 5, MICH.

Heavy-duty soluble oil solves many "in-between coolant and cutting oil" jobs

• One of the most important wartime developments in cutting fluids, made by Standard Oil, was Stanicool HD—a heavy-duty soluble oil. It filled a gap between soluble oils and cutting oils. For example:

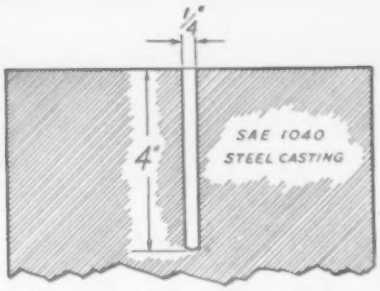
Certain metal cutting operations demand the high degree of cooling afforded by a water-and-oil emulsion but a greater degree of tool protection than is usually obtained from soluble oil. When cutting oil is used on these jobs, over-heating occurs.

Stanicool HD has eliminated these problems in many shops. Some of these jobs are briefly described at the right. A Standard Oil Lubrication Engineer can give you other examples and help you apply Stanicool HD to fill the gap between soluble oils and cutting oils in your plant.

Call the nearest Standard Oil Company (Indiana) office, or write 910 South Michigan Avenue, Chicago 80, Illinois, for a Lubrication Engineer. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

Gasoline Powers the Attack . . .
Don't Waste a Drop!

STANICOOL HD



Drills ground 1/3 as often.

Drilling a ¼ inch hole, 4 inches deep, in SAE 1040 Steel Castings, drills were sharpened every six pieces. Both soluble oil and cutting oil were tried. Both failed to give satisfactory results. An emulsion of 8 parts of water to 1 Stanicool HD increased tool life to 18 pieces per grind.

Production jumps 200% with longer tap life.

A mixture of one part Stanicool HD and ten parts water, used on a job of tapping high carbon steel, made it possible for a tap to last a full day. When using sulphurized cutting oil, taps lasted only one-half hour. More important, production jumped 200% with the use of Stanicool HD.

The greater cooling and better chip removal provided by soluble oil, plus the heavy-duty quality of Stanicool HD, will often give increased tool life and production on tapping operations where cutting oil would ordinarily be used.

Production time cut in half without impairing tool life.

A deep spading operation on a lathe making 75mm. anti-tank shells was giving good tool life and finish, but it slowed up production all along the line. When Stanicool HD replaced the conventional soluble oils that had been used, it gave equally good tool life and finish. On top of that, it reduced machining time from 51 seconds to 29 seconds per piece.

. . . either too hot or too slow.

A cutting oil was used on a turret lathe which was turning and threading bolts from SAE 4140 steel. High temperatures were encountered. Ordinary soluble oil cooled the tools, but too short tool life was experienced when heavy feeds and a cutting speed of 200 feet per minute were maintained. Stanicool HD mixed one part with four parts of water eliminated overheating and poor tool life, and permitted the maintenance of the high production rate.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATI

TWO GREAT TASKS!

American industry is putting every ounce of effort into producing weapons for swift victory. Essential too is the planning of a secure peace based on productive prosperity.

In both of these great tasks National Cutting Tools have an important part.

National cutting tools, sold by leading Mill Supply Distributors, are tools of character.

NATIONAL

NATIONAL TWIST DRILL & TOOL CO. ROCHESTER, MICH., U.S.A.

TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
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SPECIAL TOOLS

TWIST DRILL AND TOOL COMPANY

DETROIT AND ROCHESTER, MICHIGAN

Tap and Die Division—Winter Brothers Co., Wrentham, Mass.

Factory Branches • New York • Chicago • Cleveland • San Francisco • Distributors in Principal Cities

YOU see, that's our business . . . building things . . . all sorts of things.

Jones & Lamson is the oldest machine tool company in America and there is literally no industry (and few important products) to which Jones & Lamson engineering has not contributed, both in war and in peacetime production.

So you dream it . . . we'll help build it.

We'll draw up complete production specifications. We'll engineer the tooling. We'll specify, design, and create any special machine tools needed. We'll even plan the plant and its equipment.

You dream it.

We'll help build it . . . from the ground up, if need be.

These engineering facilities will become available to you as soon as conditions permit. Meanwhile, we solicit your inquiries.

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U.S.A.

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

HOW TO SOLVE

Cutting Oil Problems

Get a Heavy-Duty Soluble Oil for Big Bites Here!

WHEN your milling machine takes a big bite on a roughing job (like the one shown above), the pressure on the teeth of the cutters soars to fantastic figures—350,000 to 400,000 pounds per square inch. Heat tends to mount with the severe rubbing of the chips on the cutters.

You need a special heavy-duty soluble oil that will minimize friction, carry away maximum heat and prolong cutter life.

S/V Solvac Oil 410 meets these exacting requirements for rough milling jobs. This heavy-duty soluble oil gives you maximum cooling and maximum lubricity.

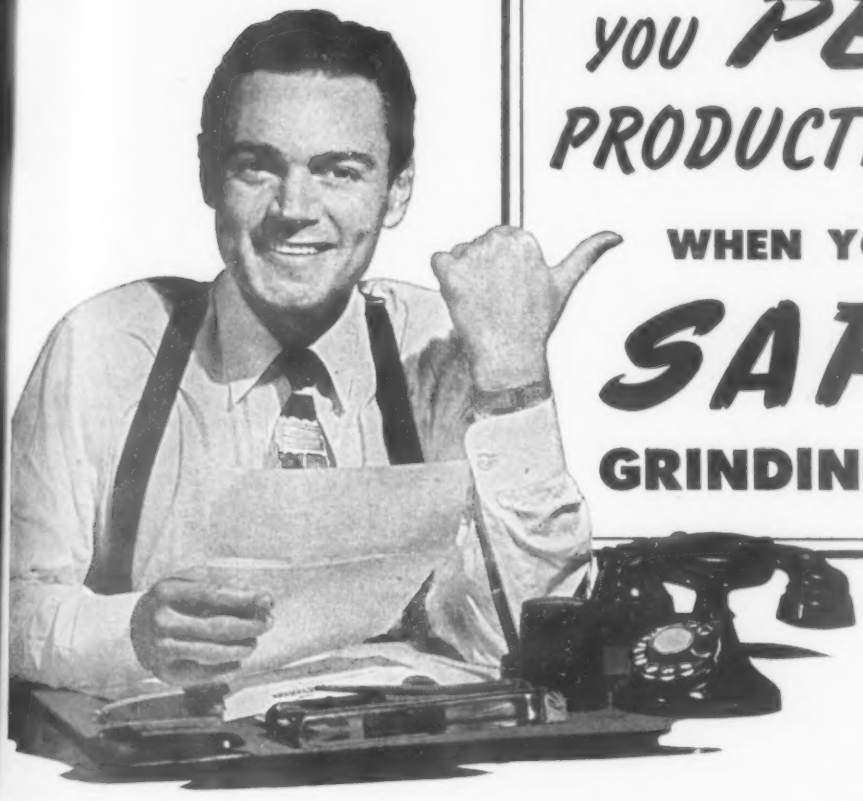
Wear is reduced. Tools require fewer grindings . . . last longer. You save maintenance time and expense and get *more* work . . . *faster*.

GARGOYLE Lubricants

SOCONY-VACUUM

OIL COMPANY, INCORPORATED

Standard Oil of N. Y. Div.—White Star Div.—Lubrite Div.—White Eagle Div.—Wadhams Div.—Magnolia Petroleum Co.—General Petroleum Corporation of Cal.



YOU "PEP UP" PRODUCTION LINES

WHEN YOU ADOPT SAFETY GRINDING WHEELS

When faced with tight war material schedules, when full production capacity is the order of the day, when production lines must be stepped up and kept moving . . . that's when SAFETY Grinding Wheels prove their class!

Because they're specifically engineered for the job they do, they are long-lived, grind fast, run cool, reduce rejections!

Unless yours is one of the scores of plants using SAFETY Grinding Wheels as standard equipment, it would pay you, we believe, to find out how they might also pep up *your* production lines, and give you greater output at lower unit cost.

Any one of the SAFETY offices are staffed and equipped to confer with you on a "brass tack" basis, to suggest one or more SAFETY Wheels for your trial, and to make prompt delivery of the ones you need for better grinding wheel performance. Get in touch with the one nearest you. Or write us direct!

Other SAFETY Products Include--

- "Rite-Speed" Double End Stand Grinders
- Swing Frame Grinders
- Portable Grinders
- Floor Stand Grinders

Your inquiries are invited. No obligations!

SAFETY GRINDING WHEEL AND MACHINE COMPANY

Main Office and Factory SPRINGFIELD, OHIO, Phone 4651

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● SALES OFFICE ★ SALES OFFICE and WAREHOUSE

New Book on Tools for Obtaining Accurate Thread Forms in Less Time

Remarkable savings are being made in thread grinding through the use of the new Tru-Thread Diamond Tools for dressing thread grinding wheels.

Tru-Thread Diamond Tools employ a radically new principle, applied for the first time by Wheel Trueing engineers, and utilize the hard characteristics of a diamond of a shape never before used for such a purpose.

The results of this new development are reported by users who tell us—for example—that with Tru-Thread Tools they are running three to four times as many pieces as they obtained with their previous tools.

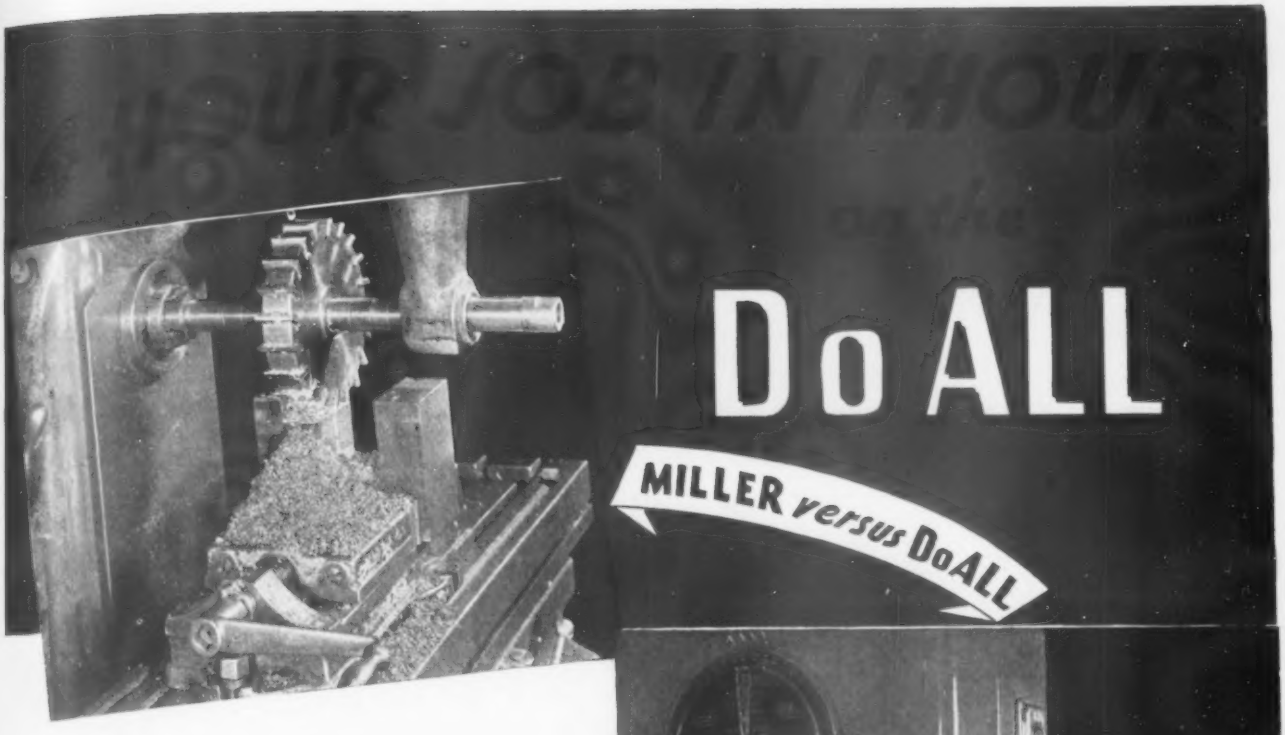
Tru-Thread Tools obtain wheel forms quickly and accurately and leave the wheel grain sharp and free-cutting. Wheels cut clean, hold their form longer and grind more pieces between dressings. Wheel cost, tool cost, and cost per piece all are reduced accordingly.

These tools, which are made in types for dressing each specific form, are completely described and illustrated in a new booklet which we will be glad to send you on request. If you have thread grinding equipment, this booklet will point the way to substantial savings. Send for your copy.

WHEEL TRUEING TOOL COMPANY

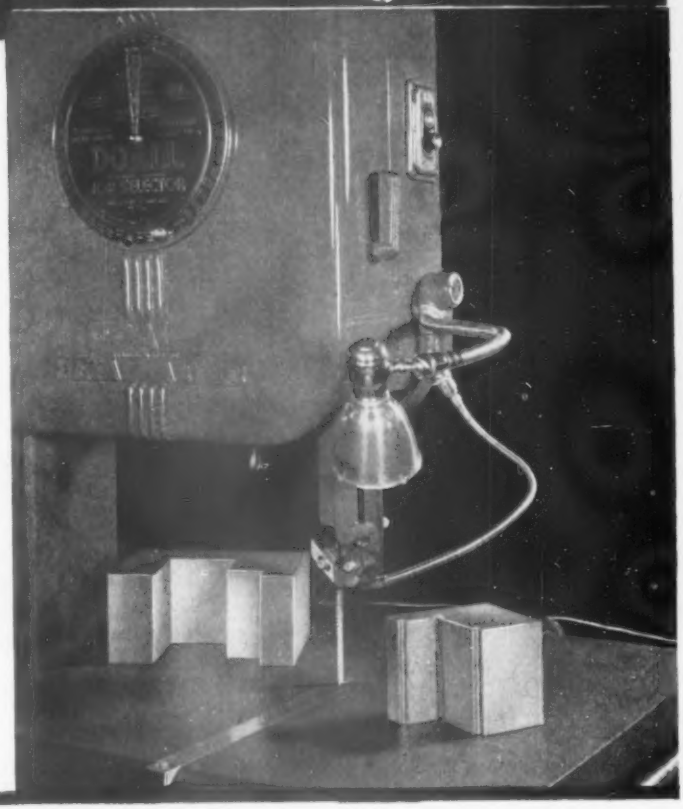
3200 W. Davison Avenue
Detroit 6 • Michigan

575 Langlois Avenue
Windsor, Ont. • Canada



DoALL

MILLER *versus* DoALL



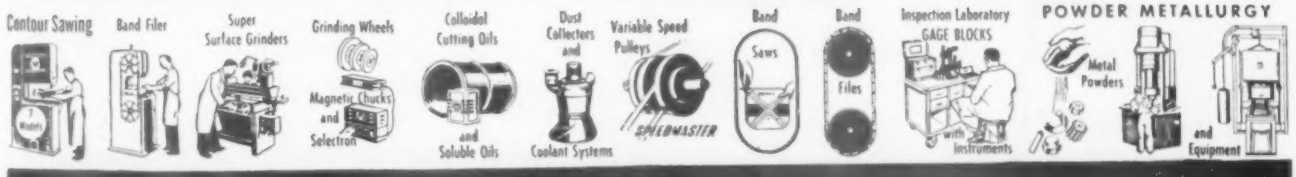
To remove a section from a certain Fixture Block, a #40 cutter was placed on a miller and in 4 hours it milled away the section, reducing it to worthless chips.

The same job was done on the DoALL in 1 hour. No set-up time was required. Sides of the cut were smooth and straight and the slug removed was solid, usable metal.

That's the kind of savings that has made DoALL today's most popular method for machining metals, alloys, plastics, laminates and wood.

Handiest machine in any plant—adaptable to internal and external shape cutting in machine shop, foundry, tool room, sheet metal room, experimental or finishing department.

The circular DoALL Advantages gives further details about DoALL's superiority. Write for copy.



DoALL

INDUSTRY'S NEW SET OF TOOLS

CONTINENTAL MACHINES, INC.

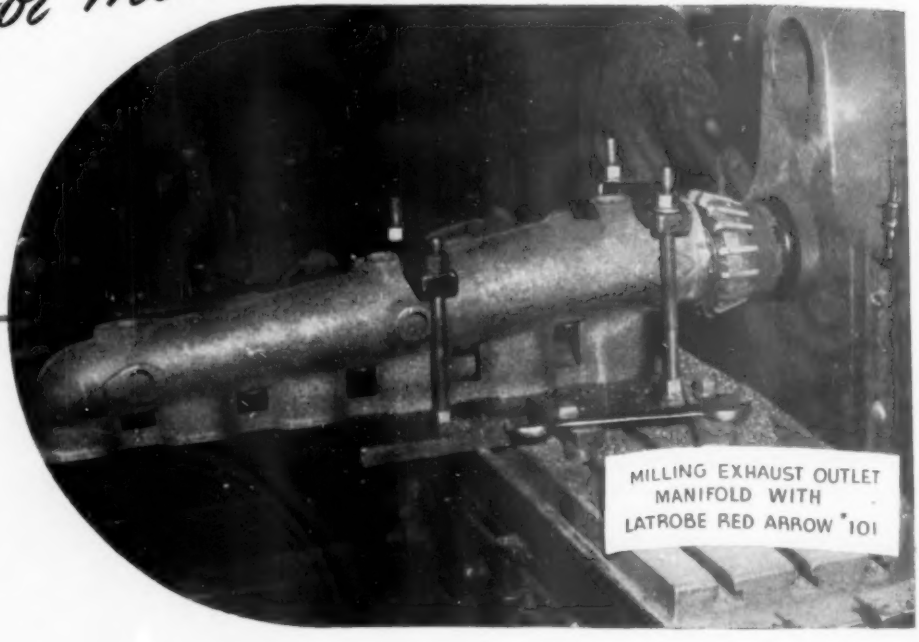
1304 S. Washington Ave. Minneapolis 4, Minn.

Sales & Service Offices: Baltimore, Birmingham, Boston, Chicago, Cincinnati, Cleveland, Denver, Detroit, Erie, Grand Rapids, Hartford, Houston, Indianapolis, Los Angeles, Milwaukee, Minneapolis, New York, Orlando, Philadelphia, Pittsburgh, Providence, Rochester, Rockford, St. Louis, San Francisco, Seattle, Toledo, Tulsa.

Have you tried

LATROBE RED ARROW

—The Superior Cast Alloy for Metal Cutting Tools



MILLING EXHAUST OUTLET MANIFOLD WITH LATROBE RED ARROW "101

Requires no heat treatment

Easily brazed to tool body

Ground with ordinary wheels

MANUFACTURERS OF SMALL TOOLS

Latrobe Red Arrow is available in the "as cast" state for grinding to the dimensions of the finished tool.

LATROBE RED ARROW Cast Alloy Cutting Tools operate most efficiently in that "intermediate cutting range" between high speed steel and tungsten carbide. Cutting tools cast from these alloys make important savings possible—***more pieces per grind, higher speeds and feeds, better surface finish!***

Standard sizes of Tool Bits carried in warehouse stocks.

Latrobe ELECTRIC STEEL COMPANY

MAIN OFFICES *and* PLANT · LATROBE · PENNSYLVANIA

Multi-Section Hole Grinding in One Simple Set-up

Looking at this 10 station progressive die with 100 holes to be located and ground to .0002" tolerance in the die and stripper inserts, you'd hardly call this a single set-up job. But that's what it is on the Moore Jig Grinder.

For on this unique machine *all the sections can be screwed and doweled into place, strapped on the table and ground in one set-up*...eliminating separate section hole grinding and the accompanying difficulty of accurately locating each section in the die bed.

Hardening distortion is quickly and accurately corrected. The Jig Grinder relocates holes, finish-grinds them—straight or tapered, within .0001"—removes the decarburized surface and produces a smoother finish. All this in *one-third* the time required by previous, more costly methods. And more uniform clearance between punch and die adds from 25% to 100% to the life of a Moore jig-ground die.

You'll want to know more about what this machine can do for you, why it is considered a toolmaker's "must," how the Moore Jig Grinder put die-making on an interchangeable parts and assembly basis. So why not write today for our technical bulletin.

MOORE SPECIAL TOOL CO., INC.

732 UNION AVENUE, BRIDGEPORT 7, CONN.

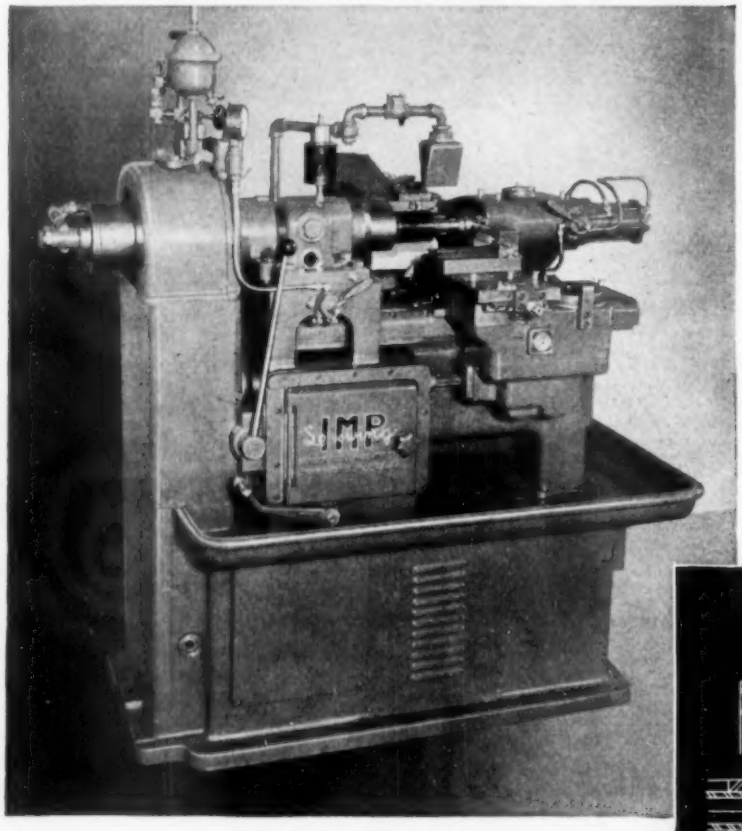
MOORE TOOLS

MOORE Jig Grinder

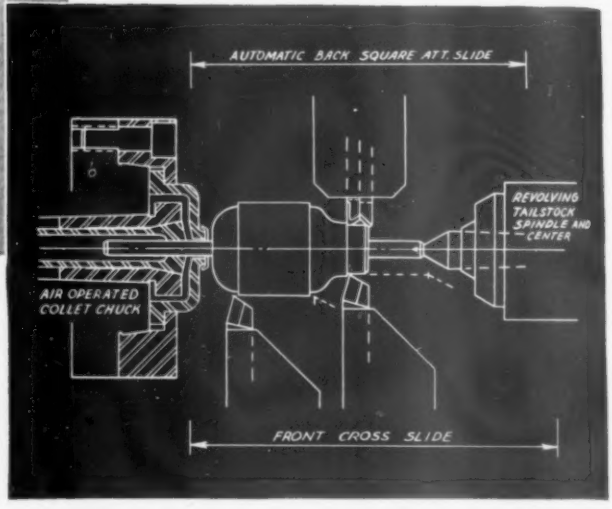
THE ONLY MACHINE OF ITS KIND

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK



ROTOR AND STARTER COMMUTATORS *Automatically* MACHINED TO HIGH ACCURACY AND FINISH ON *Lo-swing* IMP



PROBLEM: To automatically turn, chamfer and face electric motor rotor and starter commutators, maintaining a fine finish and extremely close tolerances.

SOLUTION: The Lo-swing IMP Lathe with special equipment was selected for this job primarily because of inherent design features which permit high spindle speeds and unusual turning accuracy.

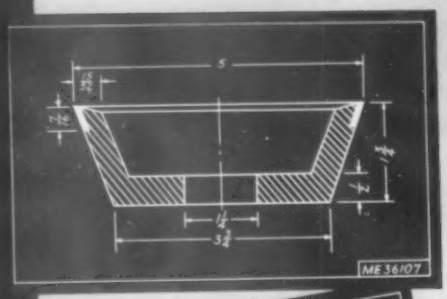
The work is held and driven from one of the ball-bearing seats of the shaft with an air-operated collet chuck. The tailstock end is supported on a revolving center, the movement of which is actuated by an air cylinder. This method of holding and driving the rotor assures the close concentricity which is required between the bearing seats and the O. D. of the commutator. The operation consists of turning the O. D. of the commutator and rotor, the facing of the shoulder (which is part of the commutator) and the chamfering of the shoulder.

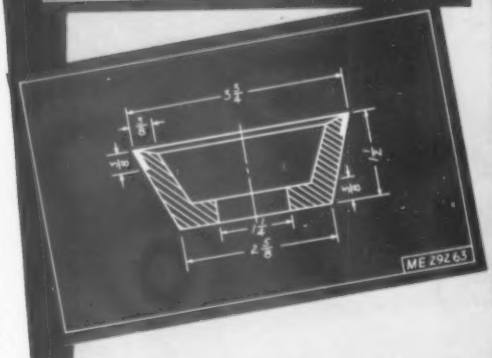
Several other Lo-swing set-ups have been developed for this type of work. We suggest you send in your prints for our estimate.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

LATHE NEWS *from* SENECA FALLS

Better Performance! Lower Costs!

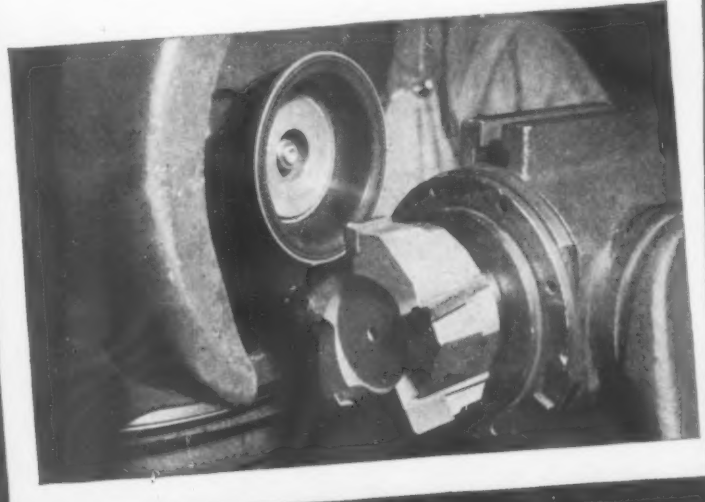




. . . With This Improved Design of NORTON DIAMOND WHEEL for Carbide Cutter Grinding

This new shape of flaring cup wheel is proving outstandingly popular for sharpening carbide tipped face mills and other multi-point cutting tools. The relatively narrow rim (1/16 or 1/8", depending on depth of diamond) gives it a cool, rapid cutting action and permits grinding in corners.

NORTON COMPANY, WORCESTER 6, MASS.



NORTON ABRASIVES

Available in Two Sizes — 5" and 3¾"

Economical

By backing off the inside of the rim up to the diamond insert as it wears down in use, the diamond section can be used up entirely. In effect it amounts to ⅜" depth of diamond in the case of the 3¾" wheel and 7/16" in the case of the 5" wheel.

Different Grades

Because these wheels are made in several grades of hardness they can be closely fitted to the job requirements.

Grit Sizes

In a single grit size for both roughing and finishing 150 grit is recommended — or 120 grit if a slightly faster cutting action is desired.

The two wheel set-up, 100 grit for roughing and 400 grit for fine finishing, is becoming increasingly popular.

A New Motion Picture on Carbide Grinding

A thirty minute color film with sound—full of practical help. Loaned free. Write for information.

W-982

The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

The soybean is now the third largest cash grain crop in the United States.

get ready with CONE for tomorrow

Aluminum can now be chemically bonded to steel so that the two become a completely integrated unit. This process has already contributed greatly to improvement in the horsepower per pound ratio of certain of our aircraft engines.

get ready with CONE for tomorrow

A 200 page book may now be printed on both sides of a 6 x 9 inch sheet and enlarged for reading by the use of a new machine. This would bring the cost of books to about five cents per volume. It is estimated that a full size encyclopedia, printed by this method, would cost about three dollars.

get ready with CONE for tomorrow

One authority states that oil can be produced from American shale in commercial quantities and at a competitive price.

get ready with CONE for tomorrow

Zein, the new shellac substitute derived from corn, is being used in shoe soles and heels, cements, rain coats, mats, gaskets, and rubber stamps. Packaging films, textile fibers, and bottle caps may be expected later.

get ready with CONE for tomorrow

Most radical of all the new power plants is one in which the fuel is burned in gas mantles and the radiant energy produced is converted into electricity by photo-electric cells.

get ready with CONE for tomorrow

Pure iron can now be deposited on non-metallic substances. By this method a surface of iron may be put on a base of rubber, wood, or plastic.

Some of the new paper-resin laminates may now be formed as easily as a cook lines a plate with pie crust, and require pressures as low as 50 lbs. per square inch.

get ready with CONE for tomorrow

Glass fabric impregnated with synthetic resin is a new material with extraordinary properties. Tensile strength may be more than 80,000 lbs. per square inch.

get ready with CONE for tomorrow

Five states have pooled their electrical generating capacity with results equalling the addition of 135,000 horsepower. This practice is expected to spread.

Aerial photography can show whether the soil of a particular area is gravel, sand, silt, or clay.

get ready with CONE for tomorrow

A new lacquer can be baked on to metal surfaces and removed by heating above 212° F.

get ready with CONE for tomorrow

An experimental Diesel engine weighs only eleven ounces per horsepower and can operate on either Diesel oil or gasoline.

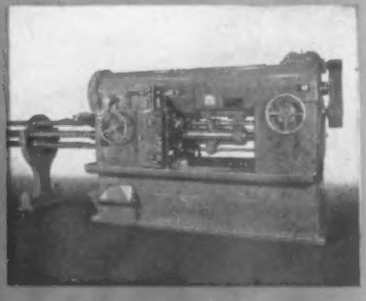
get ready with CONE for tomorrow

A Canadian manufacturer of railroad equipment has designed a flatcar to be used as a landing place for helicopters.

get ready with CONE for tomorrow

The "axonograph" is a device that photographically produces an axonometric drawing directly from a blueprint.

This machine cuts its own weight in metal in four days



3½" 6-Spindle Conomatic

To produce the part shown, 6 pounds of chips — over a sixth of a ton of metal per hour — were removed from WD1314 bar stock.

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

12

"WILCO" gives you low cost pipe Threading

Moderate price PLUS *Speed* PLUS *Accuracy* add up to *Low Cost Pipe Threading!* That's the combination you get with every Oster "WILCO" power threading machine!

The "WILCO" Die-Head covers the entire range of each machine. *Never a die-head change.* One set of holders and chasers threads all sizes of Right Hand American National Standard of the same pitch, *without change.*

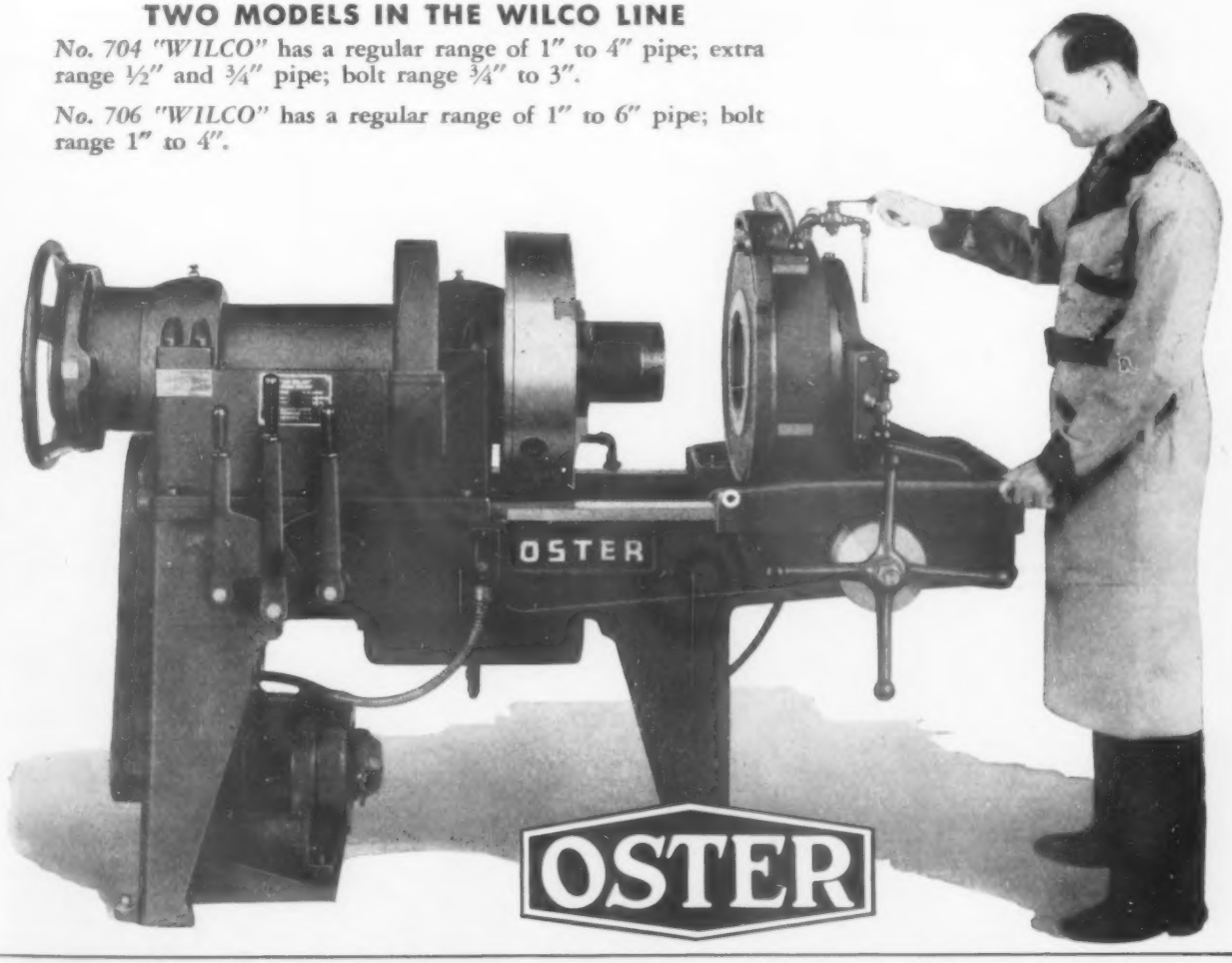
"WILCO" speeds range from *16 seconds* on 1" pipe to only *74 seconds* on 6" pipe. All other sizes at comparable high speeds.

Complete details in illustrated catalog "LIST NO. 10-A". *Write for a copy.*

TWO MODELS IN THE WILCO LINE

No. 704 "WILCO" has a regular range of 1" to 4" pipe; extra range ½" and ¾" pipe; bolt range ¾" to 3".

No. 706 "WILCO" has a regular range of 1" to 6" pipe; bolt range 1" to 4".



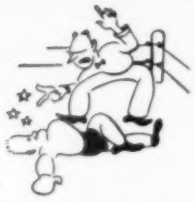
OSTER

THE OSTER MANUFACTURING COMPANY • 2063 EAST 61st STREET, CLEVELAND 3, OHIO, U. S. A.

THREE COMMON PROBLEMS IN TOOL PERFORMANCE

WEAR TOO RAPIDLY

Too frequent regrinding of a tool generally indicates the need of a tool steel with greater wear resistance. Down time for tool grinding or replacement cuts production and increases costs.



NOT TOUGH ENOUGH

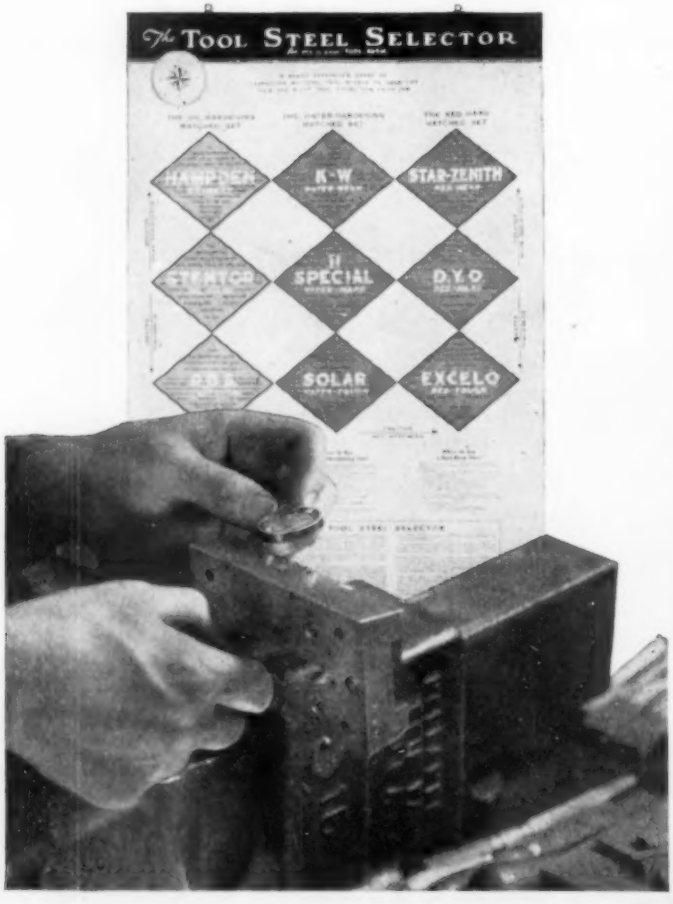
Tool breakage and crumbling of the cutting edge call for a tool steel with maximum toughness. Production time is lost and tool cost increased by tool replacement.

HARDENING TROUBLES

Hardening troubles such as cracks, excessive size change and warpage indicate the need for a steel that gives greater hardening accuracy and safety.

Carpenter MATCHED TOOL STEELS

Nine Tool Steels and The Carpenter Matched Set Method of Selection Help You . . . Avoid Tool Failures . . . Lengthen Tool Life . . . and Lower Unit Costs.



If you trace your tool failures with resulting idle men and machines, together with increased tool making costs, you will find that they are usually due to the use of incorrect tool steel or improper heat treatment. By use of The Carpenter Matched Set Method you get a plan of tool steel selection plus complete heat treating data.

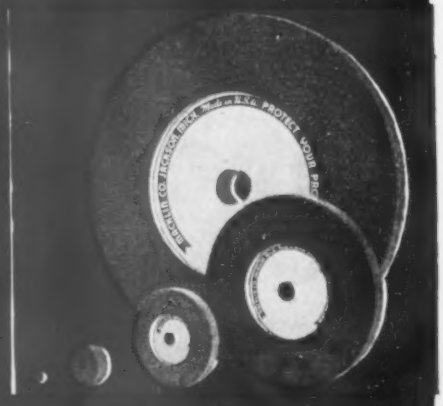
It's as easy as this: For extra wear resistance you select a steel from the top of the diagram. For extra toughness from the bottom row. And for a good balance between wear resistance and toughness from the middle row. For greater hardening accuracy and safety you move to the left and for red hardness to the right.

The Carpenter Matched Tool Steel Manual completely explains the Matched Tool Steels and the method of selection and heat treatment. Write for a copy on your letterhead today.

Carpenter MATCHED TOOL STEELS

THE CARPENTER STEEL COMPANY
122 W. Bern St., Reading, Pennsylvania

MACKLIN



MACKLIN thread grinding wheels, available in various grain sizes (depending on type of thread and finish required) have been proved most successful on practically all types of thread grinding. Many case studies could be cited which have demonstrated that Macklin thread grinding wheels will cut costs and increase production on both external and internal threads. With so many complicated problems and variants in thread grinding, for best results, it is wise to ask for the services of a Macklin Field Engineer to assist in determining the right wheel to use on a given job.

MACKLIN high quality wheels, in all sizes and shapes for EVERY grinding purpose will

"PROTECT YOUR PRODUCTION"

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

Sales Offices: — Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

Conversion Job... from BORING to MILLING

and at a substantial saving in machine cost

This Snyder two-way machine originally was designed and built for a medium boring operation on an ordnance part. When that particular contract was completed, the machine was turned over to Snyder for conversion to a milling operation on another ordnance part.

The conversion process utilized most of the original machine including base and units. Two single-spindle heads were mounted on each end, these being hydraulically operated and electrically controlled by push button.

Besides the considerable saving in time, there accrued also a saving of approximately 50% as compared to the cost of a new machine.

Many machines now operating on war contracts are similarly convertible and offer comparable opportunities for savings in time and money. The time-saving feature will be particularly important when the objective is to reach markets with civilian goods as quickly as possible.

Anticipating the day when war contract machines will become available for conversion to peacetime production, we suggest that you get in touch with us now with the idea of discussing your machine conversion problems and objectives and—as a farsighted precaution—possibly making a reservation for the engineering and plant facilities which will be required for your conversion work.

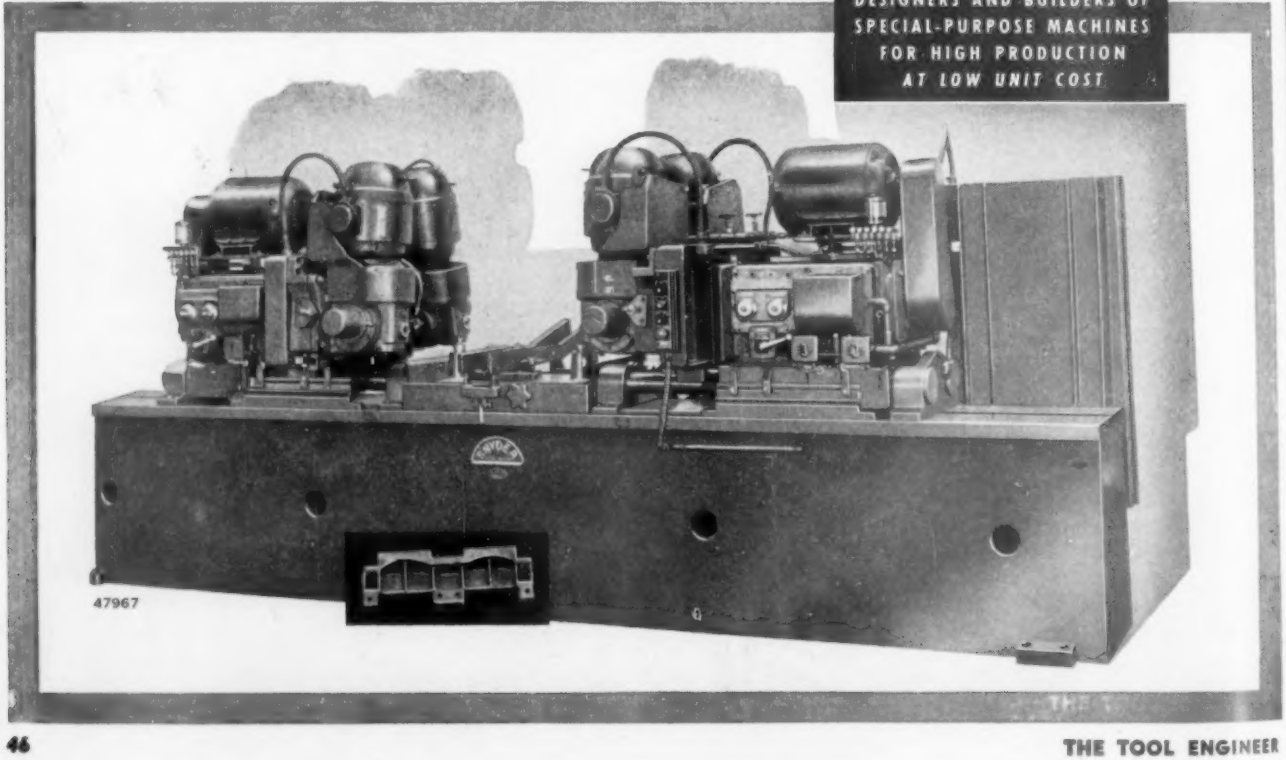
We invite you to write us in full confidence. *Snyder Tool & Engineering Company, 3400 E. Lafayette Ave., Detroit 7, Mich.*

PLAN Your PRODUCTION when you PLAN Your PRODUCT

20 Years of Successful Co-operation with Leading American Industries

SNYDER

DESIGNERS AND BUILDERS OF SPECIAL-PURPOSE MACHINES FOR HIGH PRODUCTION AT LOW UNIT COST



CLOSE ACCURACY for Grinding Small Parts

4" TYPE H PLAIN HYDRAULIC GRINDER

This matter of accuracy is relative—

You can grind work within unbelievably close limits if—if cost and time consumed are not taken into consideration. Just as they should be, however, these are the two determining factors.

When accuracy of output is claimed for the Landis 4" Type H, economical production is included. So is the possibility of using operators with limited training. And so is the assurance that results will be consistent day after day, job after job. For full details, write for Catalog A 44.

5A

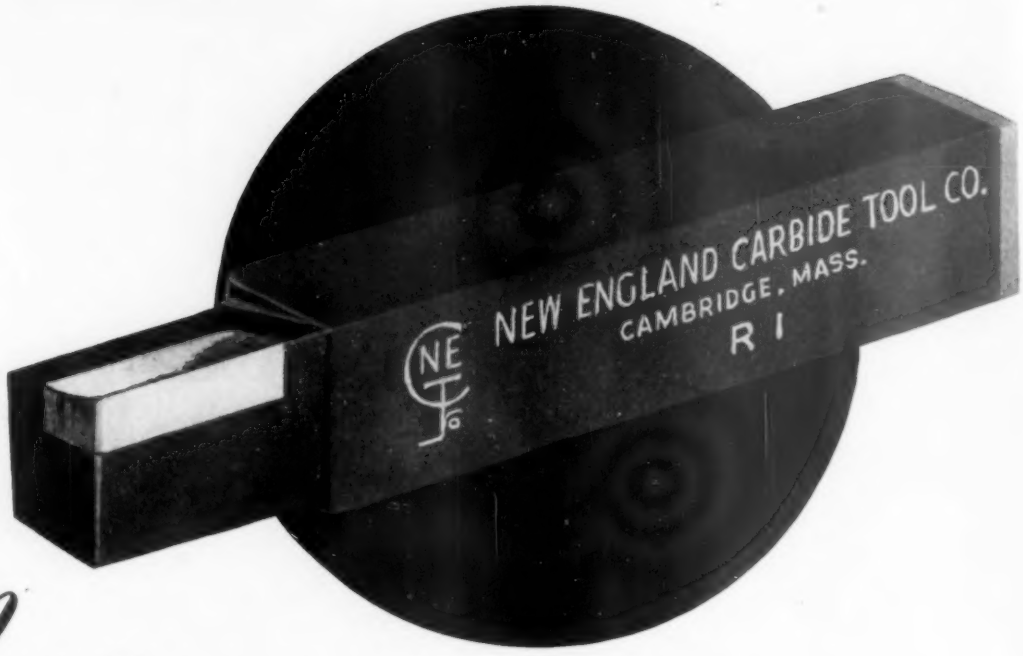
LANDIS TOOL *Precision Grinders*

Outstanding Examples of Grinding Accuracy

- Electrical instrument manufacturer grinds small shafts easily within a limit of plus or minus .00015". Generally speaking, instrument parts are exceedingly small and must be ground within a close degree of accuracy.

- Ball bearing manufacturer form grinds the outer raceway of small inner races, holding to a limit of .0002" concentricity and .0005" diameter. Production is 128 per hour. During this operation, which is the finishing operation, .005" stock is removed.

LANDIS TOOL COMPANY
WAYNESBORO, PENNA.



Never A FINER LINE OF CARBIDE TOOLS *anywhere*

That's a strong statement, but here are the facts — everywhere our salesmen go, we get this general comment — "We've seen your ads and folders and New England tools look swell, but we figured the retouched photos were an exaggeration. When we see the actual tools, however, we find that that mirror finish is really the truth, and the black shanks and color identification really look better than any photo could show."

It is the truth, and we, or our representatives, will be pleased to send you a tool (right off the shelf) to prove this point.

All standard New England lathe tools are now attractively packaged *and stocked* for immediate delivery.

You get all these features, which result in greater output and finer work finish, *at a price that is as low as ordinary carbide tipped tools.*

Write for folder which gives complete details and prices.

MIRROR FINISH

ATTRACTIVELY BOXED

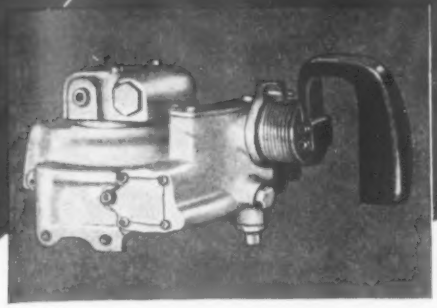
LOWEST PRICES

STOCKED BY DEALERS

NEW ENGLAND CARBIDE TOOL CO., Inc.

60 BROOKLINE ST., CAMBRIDGE 39, MASSACHUSETTS

POWER THAT OBEYS A TWIST OF THE WRIST



Oilgear generator (pump) which supplies fluid power to an Oilgear motor for traversing turrets in all tanks mentioned and many others. These Oilgear systems provide high traverse speed, exceptionally accurate control and dependability.

Oilgear's EAGER RESPONSIVENESS MAY WIN A POSTWAR BATTLE FOR YOU

Alert and forward-looking "peace" machine designers and users are finding new paths to efficiency by watching the performance of machines of war . . . at war. Take for example, America's newest M3 and M5 light tanks and M4 mediums. Here, in all these, is power at the twist of a wrist, supplied by Oilgear Fluid Power systems, to enable the gunner to traverse and train the turret (and guns) on the target, quickly, accurately and without effort. He gets extreme speed instantaneously when searching out a new target. He gets extreme deceleration when he has found it, and low tracking speed as he trains his gun on the moving target or when he is moving past a stationary target. In brief, he has instantaneous torque, extreme range of speed, steplessly variable speed from zero to maximum and return. He has tremendous power in small compass. He has absolute control over power and speed, in this case, from a simple handle which he twists from side to side. Whether *you* need *these* Oilgear characteristics or a combination of scores of other functions to improve a machine, better its operation or solve a hitherto "impossible" problem, write and ask Oilgear engineers for their recommendations. There is no obligation of course. . . . THE OILGEAR COMPANY, 1308 West Bruce Street, Milwaukee 4, Wisconsin.

ARE YOU TRYING TO:

1. Apply large forces through long . . . or short . . . strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction . . . with or without pre-set time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light . . . or heavy . . . forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R. P. M. or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full pre-set automatic control, elimination of problems of shock, vibration, etc.?

You Need Oilgear!

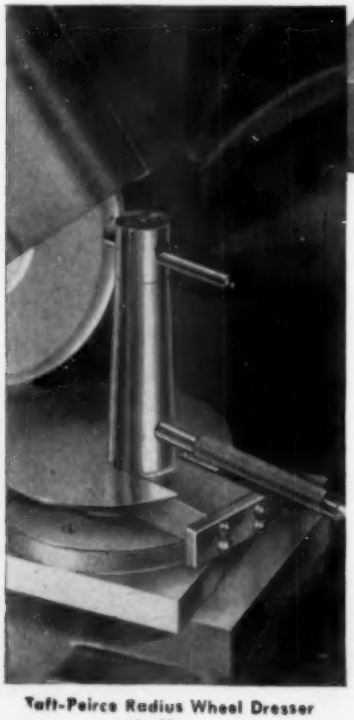
OILGEAR

Fluid Power

TAFT-PEIRCE

Radius Wheel Dresser

improves Contour-Grinding on any small surface grinder



Taft-Peirce Radius Wheel Dresser in Use.

This Taft-Peirce precision fixture increases the accuracy of contour-grinding on special gages, form tools, and similar work. It is designed for use on the Taft-Peirce No. 1 Precision Surface Grinder which takes work-pieces up to 5″ x 12″, as well as on the Taft-Peirce 6″ Rotary Surface Grinder. And it can also be used on any other small surface grinder.

The Taft-Peirce Radius Wheel Dresser has a hardened, ball-bearing rotating member which sustains accuracy over an exceptionally long period of time. A setting gage is provided for centering the diamond point on the center of rotation. And there are pins, located on the base and slide, for measuring the exact radius to be developed. For full details on this and other Taft-Peirce attachments and accessories to improve the performance of small surface grinders, write on your letterhead for the new illustrated bulletin, No. 744.

THE TAFT-PEIRCE MANUFACTURING COMPANY

WOONSOCKET *RHODE ISLAND*

Use RED RING Lapping for Gear Teeth

When gear tooth surfaces have to be lapped, either to meet specifications or to correct heat treat distortion, the Red Ring Rotary Crossed Axes Method is preferred because of its unusual speed, accuracy and economy.

The Red Ring lap tooth surfaces slide over the work gear teeth in two directions simultaneously—a true lapping action. Furthermore, the pressure exerted on the work gear teeth is the same below the pitch line as it is above. This produces uniformly lapped tooth surfaces.

Spur, helical, shoulder and cluster gears with high, low, or ELLIPTOID tooth forms may be lapped on this machine. The machine is fully automatic and adjustable. If desired, the automatic cycle may be set to remove more stock from the drive face of the teeth than from the opposite face. Skilled operators are not required.

WRITE
FOR DESCRIPTIVE BULLETIN

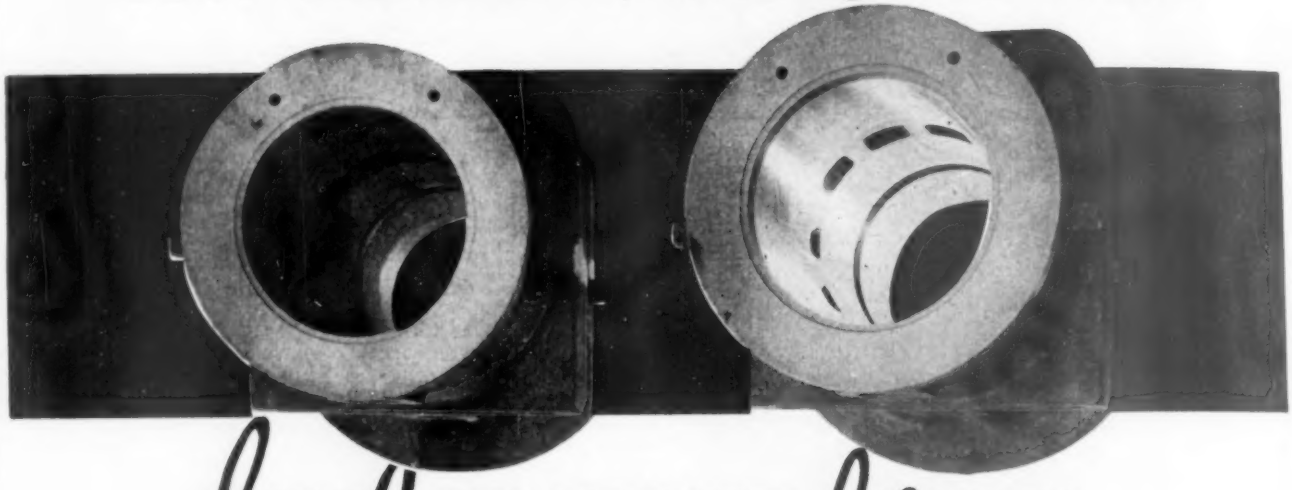
NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

5600 ST. JEAN DETROIT 13, MICH.

Specialists on Spur and Helical Involute Gear Practice
Originators of Rotary Shaving and Elliptoid Tooth Forms

Here's Proof That Honing Is a Better Solution to Your Internal Finishing Problems

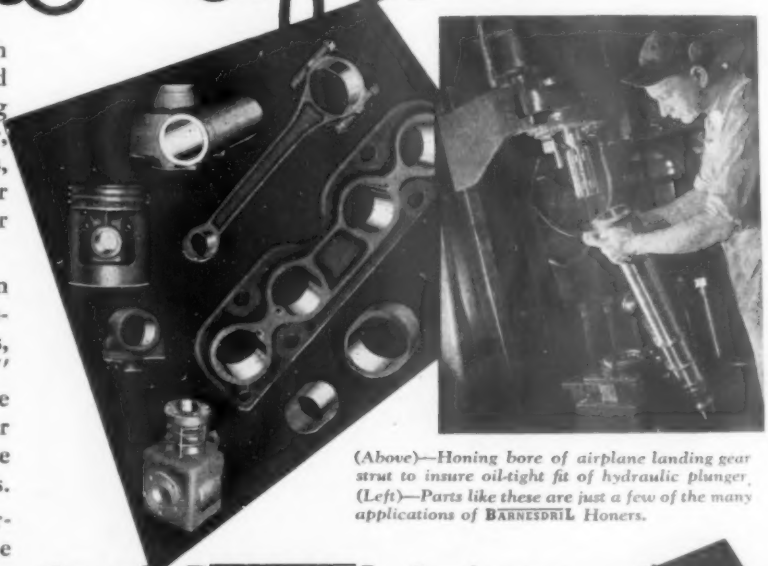


COMPARE THESE UNRETOUCHED PHOTOGRAPHS MADE before AND after HONING

• A BARNESDRIL Honer produced the finish shown here, accurate to within required tolerance of .001", successfully eliminating all surface irregularities, tool marks, chatter, hills and valleys, etc. The photographs, shown above, are unretouched in any manner and were made of this Diesel engine cylinder before and after honing.

In countless applications like those shown on this page, BARNESDRIL Honers are producing finish on internal surfaces of bores, short or long, within a range up to 42" diameter with outstanding savings in time and manpower. Finish accuracy of .0005" or less on small work, where required, may be obtained with BARNESDRIL Honing Machines.

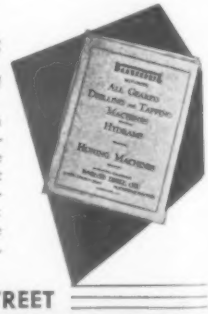
BARNESDRIL Honers are available in vertical, horizontal or angular types with one or more spindles. Single spindle honers are recommended for honing of individual parts where high production is not required. Multiple spindle machines are being used successfully and extensively for the honing of work such as cylinder blocks, and for the mass production honing of individual pieces chucked on a special multiple holding fixture.



(Above)—Honing bore of airplane landing gear strut to insure oil-tight fit of hydraulic plunger. (Left)—Parts like these are just a few of the many applications of BARNESDRIL *Honers.*

Consult BARNESDRIL Engineers ...See How Honing Can Help You

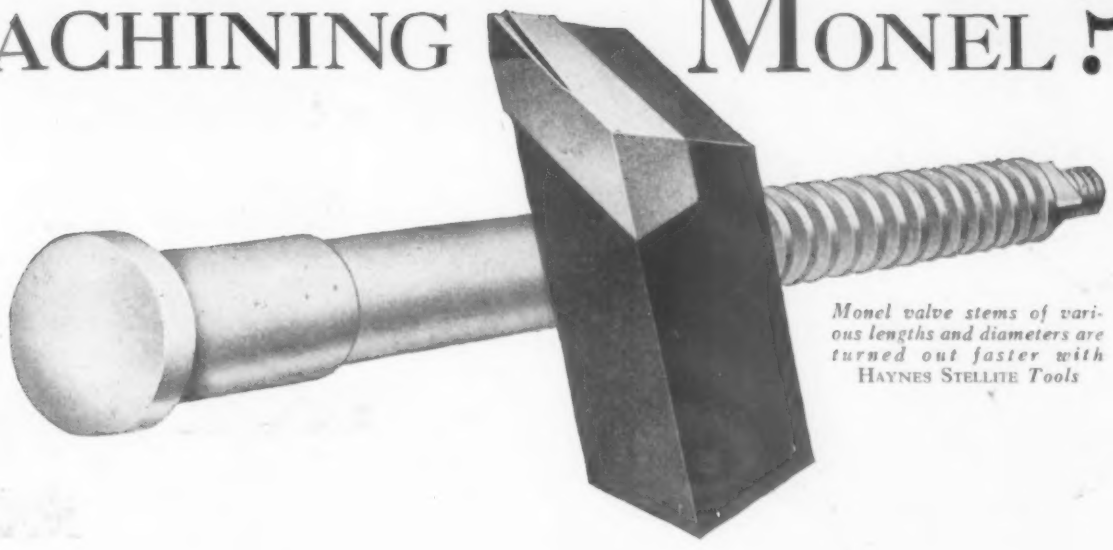
When planning the production of your new product, or when you retool to again begin production of your pre-war and post-war products, take advantage of the rapid strides made in the refinement of the honing process during these war years. Submit part, print or specifications to BARNESDRIL engineers. You'll receive their recommendations on the right Honer for your work without obligating yourself in any manner. Meanwhile, write for the FREE book, T-121, on the BARNESDRIL Honing Process.



Barnes Drill Co.

848-71 CHESTNUT STREET
ROCKFORD
ILLINOIS, U. S. A.

MACHINING MONEL?



Monel valve stems of various lengths and diameters are turned out faster with HAYNES STELLITE *Tools*

Read about the Job this HAYNES STELLITE Tool is doing on Monel Valve Stems

• This 1-in. square box tool, fabricated in the user's shop by brazing a HAYNES STELLITE 98M2 tip to a steel shank, does the combined rough- and finish-turning of valve stems made of cold-rolled Monel at a speed of 557 r.p.m. . . . 240 surface feet per minute . . . with a feed of .021 in. and a ⅜-in. depth of cut.

After 30 hours of use, the tool shows no signs of wear. The tool is ground to provide a 15-deg. side rake angle and a 15-deg. back rake angle; end and side relief angles of 6 deg.; a radius of 1/32 in. . . . and no lead angle.

Another HAYNES STELLITE tool subsequently cuts the acme thread at 297 r.p.m. . . . 72 surface feet per minute, with a cut of .020 in. per pass.

If you are machining Monel, a letter or phone call to our nearest office will bring a representative to tell you more about the production records HAYNES STELLITE cobalt-base alloy tools are making on this metal . . . and also on steel, cast iron, bronze, and other materials.

If you prefer, you can learn more about 98M2 tools . . . and how they can be used to reduce floor-to-floor time and machining costs . . . by writing to Kokomo for the descriptive booklets illustrated here.

Price List—For a descriptive price list of HAYNES STELLITE 98M2 metal-cutting tools, write and ask for Form 5783.

•

Operating Information—This new booklet is full of operating information on 98M2 Tools. To obtain a copy, simply ask for Form 5350.

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

New York 17, N. Y. UCC Kokomo, Indiana

Chicago — Cleveland — Detroit — Houston — Los Angeles

San Francisco — Tulsa

BUY UNITED STATES WAR BONDS

• HIGH-PRODUCTION METAL-CUTTING TOOLS •

"Haynes Stellite" is a registered trade-mark of Haynes Stellite Company.

After the Ticker Tape . . . what?

The whistles will blow, the bells will toll—we'll shower them with ticker tape and tears of joy—then what?

Then the victory they've won and all the things they've fought for will be in our hands to hold . . . We have all the weapons we could want: Productive capacity, technical skills, buying power, and need. How, then, could we possibly fail?

Only by lack of planning now for total peace.

And in this critical hour of preparedness for peace, the engineers of the basic machine tool producers again have a strategic part to play.

They helped the men of government and of industry to plan the most desperate and gigantic production program of all time . . . and they can help those same men now to solve our post-war problems of reconversion.

One of these is a Bryant man. We offer his services to you.

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.

SOCKET SCREWS FOR *Stronger* FASTENINGS

RULE OUT FAILURES WITH PARKER-KALON *Controlled Quality*

Greater holding power – resistance to severe stresses – these are two of the many good reasons for using Socket Screws in your product assembly.

That's why it's good judgment to choose Socket Screws that give you predetermined assurance of dependable strength – screws held to exacting standards of trouble-free performance by Parker-Kalon's Quality-Control routine.

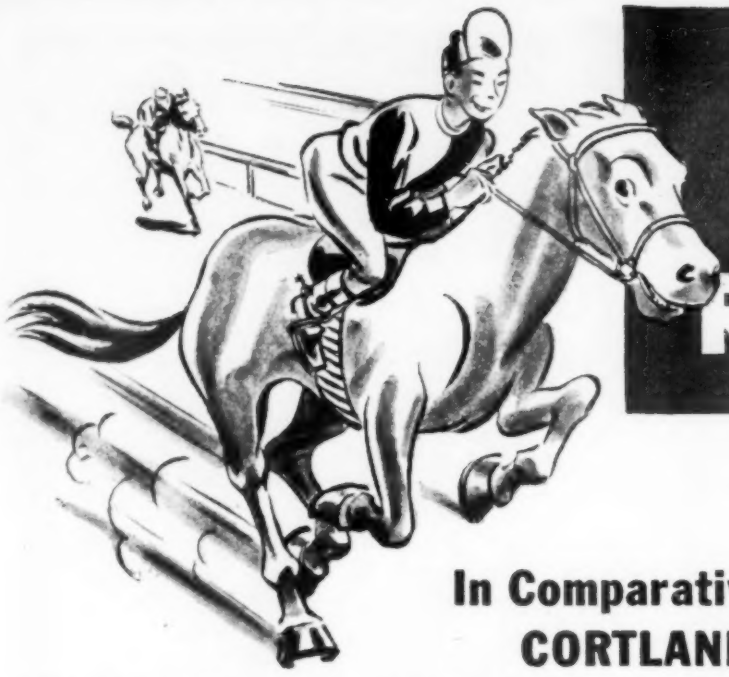
Unequalled in the industry for scientific thoroughness, this continuous check-up of every mechanical and physical characteristic rules out "doubtful" screws – screws that *look* all right, but some of which fail to work right. Tests and inspections cover Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Torsion and Shear; Hardness; Head and Socket Size; Thread Fit.

Specify Parker-Kalon Socket Screws next time you order . . . they cost no more. Parker-Kalon Corp., 208 Varick St., New York 14, N. Y.

PIPE PLUGS CAP SCREWS STRIPPER BOLTS SET SCREWS

PARKER-KALON Quality-Controlled SOCKET SCREWS

A product of PARKER-KALON ... Specialists in Fastening Devices



IT WAS A RUNAWAY

In Comparative Productive Capacity with CORTLAND CHUCKS and SEGMENTS

Another War Production Test result is in—with Cortland Chucks and Diagonal Shearing Segments running far ahead of a competitive brand . . . Cortland producing more at less cost.

TEST FACTS: A large maker of ball bearings . . . using a Blanchard No. 18 Vertical Surface Grinder. Wheel Speed 720 R.P.M.

WORK: Ball Bearing side plate retainer. S.A.E. 52100 Steel hardened to 64 Rockwell "C" scale. 4.472 sq. in. surface ground per piece, 57 pieces per table load.

AND HERE ARE THE RESULTS:

Detail	CORTLAND Chuck and Segments	*Competitive Segments Formerly Used*
Cubic inches of stock removed per inch in height of segments	588.4	350.6
Ampere readings	15	30
Dressings necessary	1	2
Work heat	No	Slightly
Grinding time	3 min. 47 sec.	8 min. 50 sec.

Notice the vital savings accomplished by Cortland: Ampere Readings cut in *half*; one dressing instead of two; *cool* grinding; and production completed in 43% of the time required formerly. Naturally these results brought a substantial order for Cortland *Diagonal Shearing* Segments.

You may obtain comparable improved results and lower costs from Cortland Chucks and Segments. Why not write for latest illustrated bulletin giving the complete story of Cortland performance.

CORTLAND GRINDING WHEELS CORP.

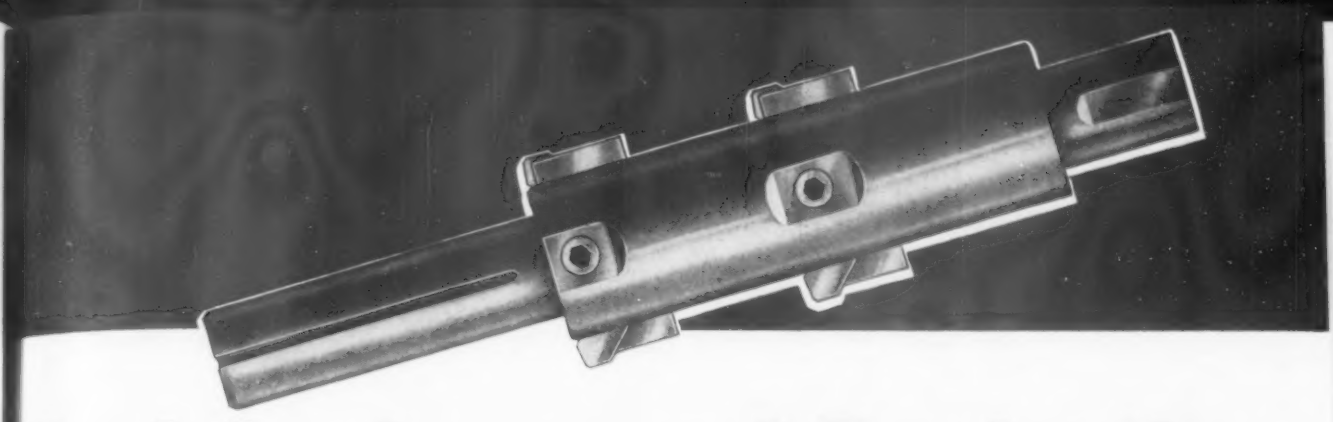
14 Cortland Street Chester, Massachusetts

7

Diagonal Shearing with Varying Contact Means Better Surface Grinding

A true segment, the grinding surface has narrow ends that *start* the work with minimum shock and resistance. Straight inner edge of segment passes diagonally across work with a *shearing* action that *cuts* and *removes* the metal. Varying contact area insures longer exposure to coolant—decreases heat—reduces segment wear—conserves power.

CORTLAND
Chucks and Segments

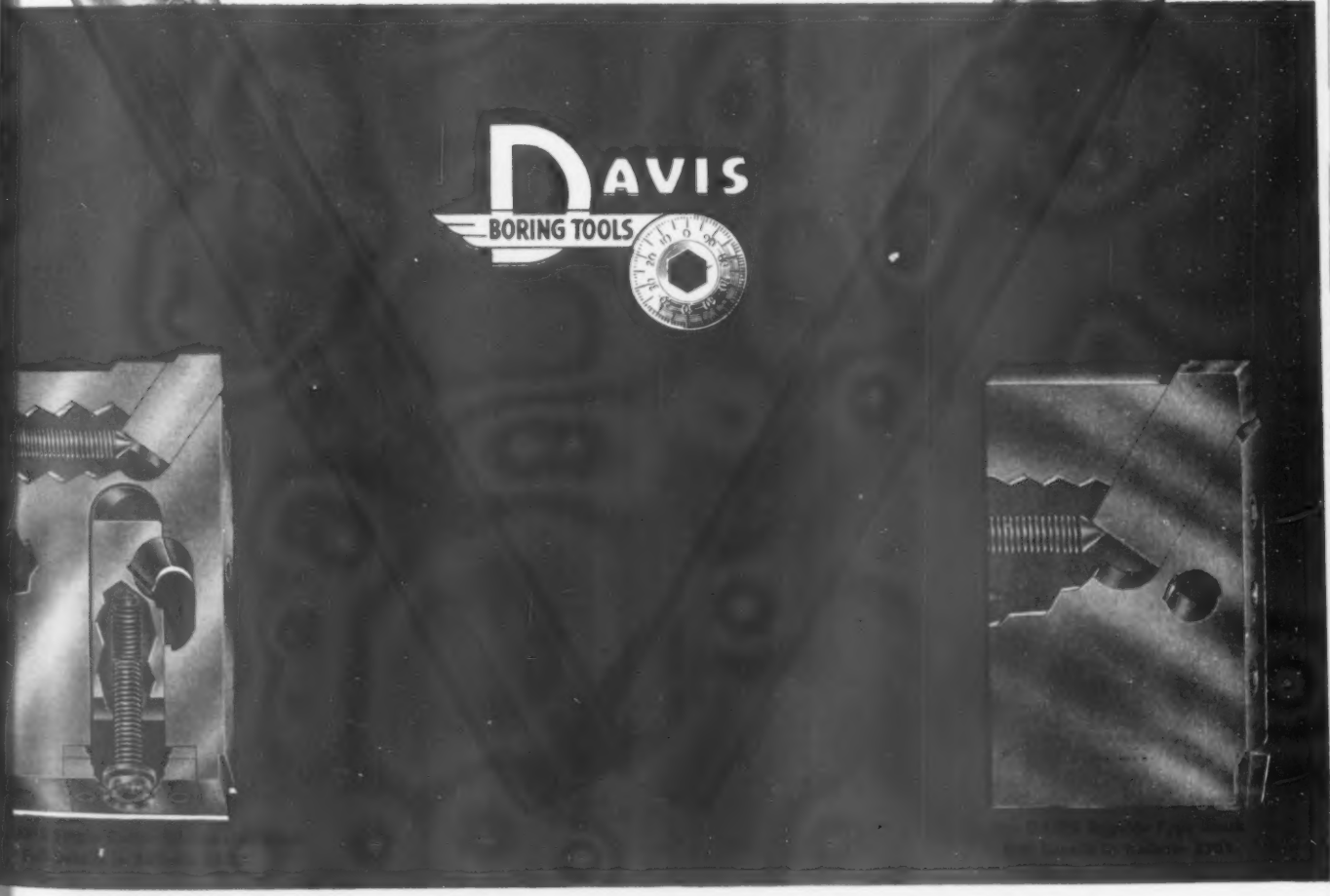


Tool for Increased Production

with DAVIS

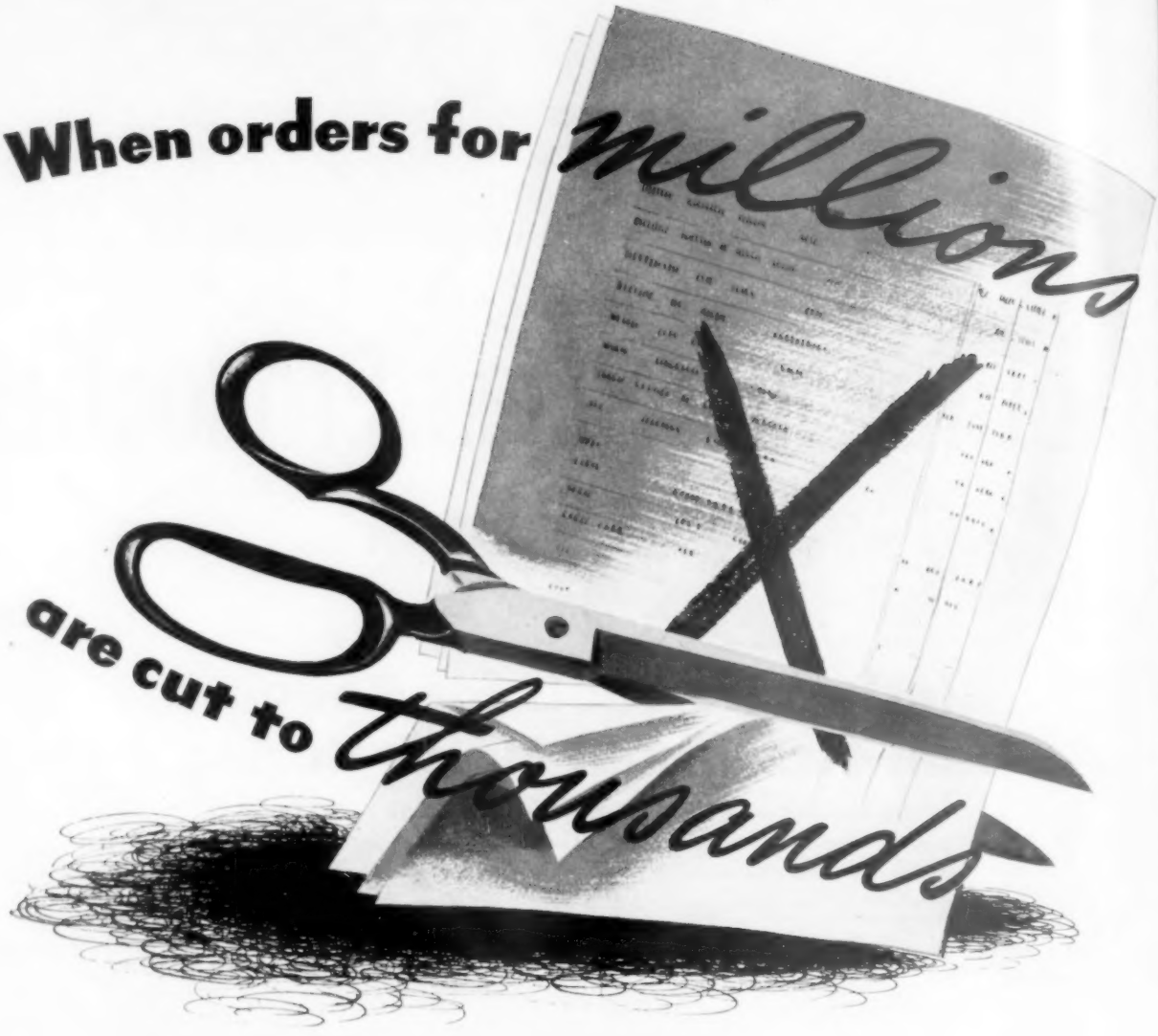
Block Type Tools for Rough, Semi-Finish and Finish Boring

Where precision work is an absolute necessity, DAVIS Boring Tools are the tried-and-proved answer. In war plants all over the United States, they have set amazing new standards for accuracy—speed—economy. If you have any kind of a boring problem, write us today.



DAVIS BORING TOOL DIV. LARKIN PACKER CO., INC., ST. LOUIS 14, U.S.A.

When orders for millions are cut to thousands



TESTED and proved by major aircraft builders, Masonite* Die Stock will be eagerly sought by every industry which wants to get into post-war production – fast!

For this remarkably light-weight, low-cost material can be fabricated in pattern or metal shop at great speed – giving you the triple saving of weight, time and money.

This all-around economy makes Masonite Die Stock the perfect material in producing dies for reduced production runs. And its great compressive and flexural strength equips it for heavy duty, too.

Available in thicknesses of ¼ to 2 inches ... in sizes of 48 x 72 inches and 48 x 144 inches. For complete details about this modern money-saver, please fill out and mail coupon.

PRODUCTION PIN-UPS. *Look for the next issue of "Production Pin-Ups" on your plant bulletin board. They give you pictures and explanations of the latest uses of Masonite Die Stock.*

Trade-mark Reg. U. S. Pat. Off. COPYRIGHT 1944, MASONITE CORP.

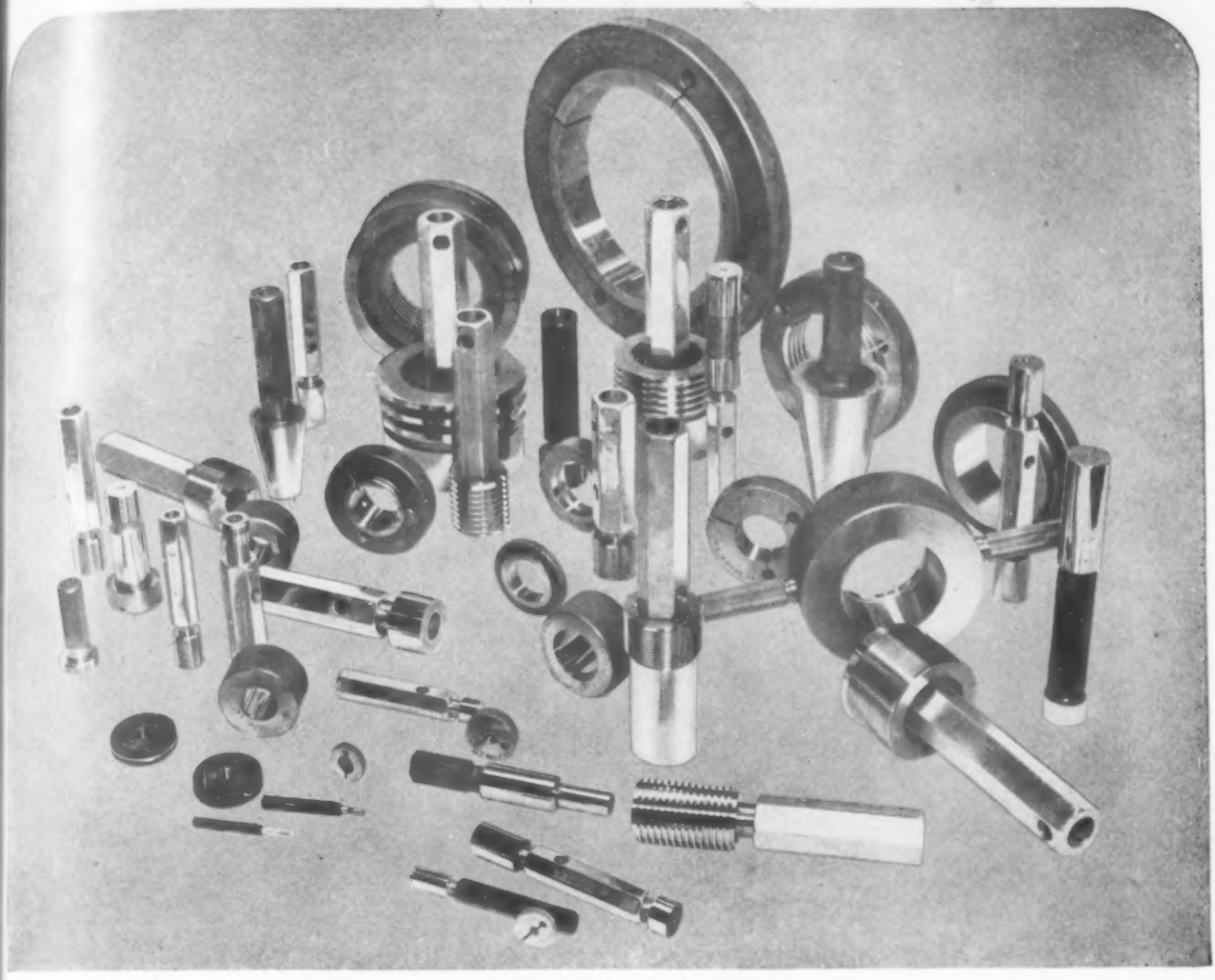
MASONITE CORPORATION *Dept. TE-12, 111 W. Washington St., Chicago 2, Illinois*

Please send me illustrative literature and complete information about Masonite Die Stock.

Name and firm _____

Address _____

City _____ *State* _____



Weapons . . . for both War and Peace

Right now, our industries are working to produce better machines for war—and more of them.

In this effort gages have an important part. They control the accurate dimensions which make modern mass production, with its interchangeability of parts, a practical manufacturing method.

One day—perhaps soon—much of this war production will again return to the making of the products of peace. Again, gages will have an important share in making those products better and more plentiful.

Gages bearing the PM Diamond emblem are ACCURATE. That one word tells the whole story, for accuracy is the only reason for using a gage.

If you use gages, of any type, we'd like to hear from you.

PM CO

ARMY E NAVY

The PIPE MACHINERY COMPANY Cleveland, O.

GAGES • MULTIPLE THREAD MILLING CUTTERS • SPECIAL TOOLS

Designed for faster milling; for removing more metal; for faster, more economical operation and better finish.

Use Tantung when you cannot use carbide. No special equipment required. Any milling machine has sufficient power to operate Tantung efficiently. Tantung is easy to sharpen; use the same grinding wheels you are using for high-speed steel. Tantung is tough and shock-resistant. It should be run at far greater speeds than recommended for high-speed steel.

Supplied in Five Sizes:
2¼"-2½"-3"-3½" 4" diameters.

Replace your high-speed steel cutters with Tantung and watch your production jump; your costs go down. Write for Price List. Sold and serviced by

Vascoloy-Ramet Corporation

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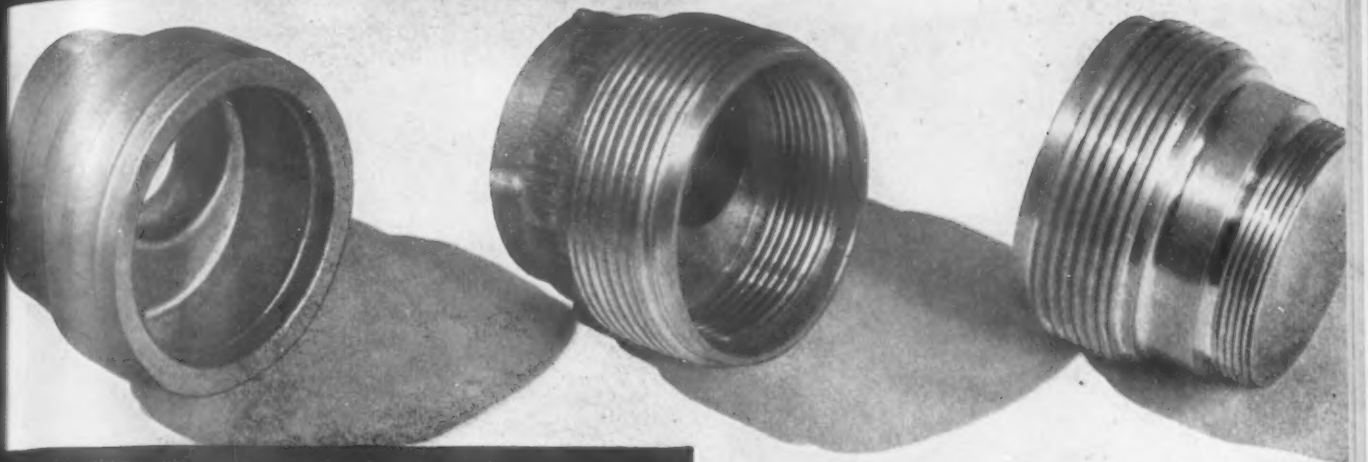
Could you finish both ends at the same time?



Or would you do the job slower on 2 machines?

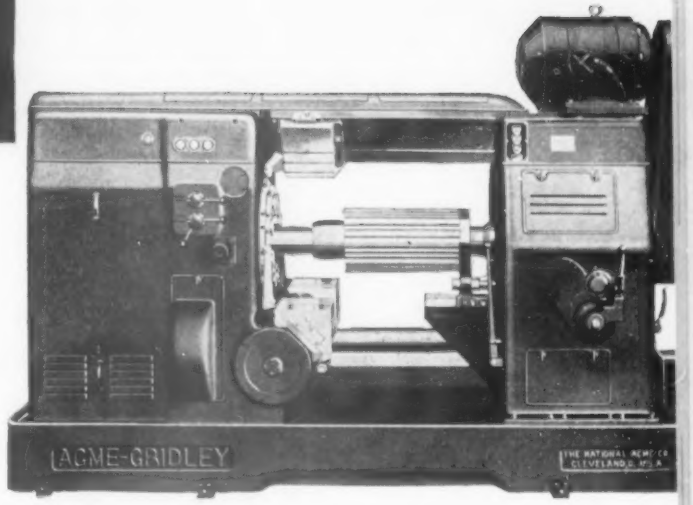
Could you finish both ends at the same time (or would you do the job slower—on 2 machines)?

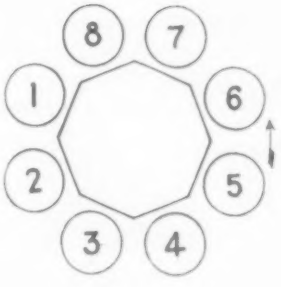
It's the bronze forged M-20 booster, a war job—tooled for double indexing with 2 sets of tools cutting simultaneously on an ACME-GRIDLEY 8-Spindle Chucker.

These new machines with their adaptability to handling many operations at one time are actually 2½ times faster than the machines of ten years ago—in spite of the tougher alloys, higher tolerances and faster speeds demanded by modern standards.

In the highly competitive markets ahead, ACME-GRIDLEYS will help to turn out better products at lower cost, and therefore lower selling prices. They are more than mere production machines—they are sales producers.

Send for booklet "How Costs Were Cut on 25 Chucking Machine Jobs".



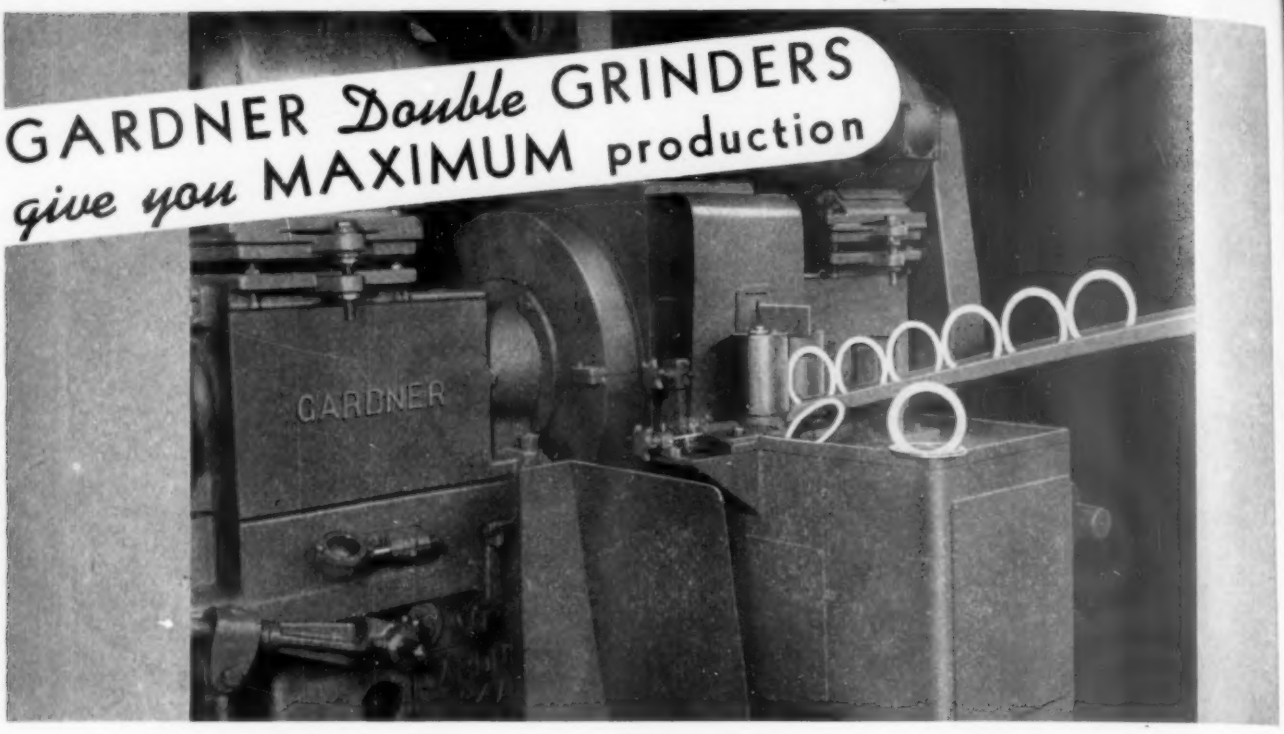


With this machine arranged for double indexing, operations on the large end of the part illustrated were done in spindle positions 2, 4, 6 and 8. The part was then repositioned and the operations on the small end were done in spindle positions 1, 3, 5 and 7. *This one machine did a two-machine job.*

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS
THE CHRONOLOG • LIMIT. MOTOR STARTER AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING



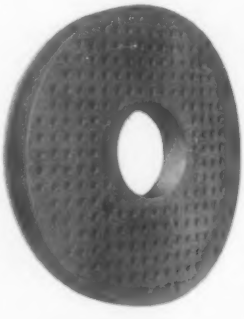
on *dozens* of parallel-surface jobs!

HERE'S an example — thin steel gears, measuring 6" O.D. x 4⅝" I.D. x .075" thick, are ground on both faces AT THE RATE OF 25 TO 30 PIECES PER MINUTE, PER CUT!

The machine is a No. 84A-30" Gardner PRECISION Double Grinder, equipped with our "push-through" type fixture. The gears are fed from an inclined chute, into a pair of rubber feed-rolls, which send them through the opposed grinding wheels on steel guide bars, in a continuous stream.

Two cuts are taken, the first in the soft state, removing about .008" overall stock; the second cut, after hardening, removes approximately .002" stock. TOLERANCES: .001" for size, or uniformity, and .0005" to .00075" for parallelism!

Use Modern GARDNER WIRE-LOKT Abrasives on YOUR Disc Grinders!



Check the advantages of GARDNER DOUBLE GRINDING on your own parallel-surface parts — WRITE FOR FULL DETAILS!

ARMY E NAVY

GARDNER MACHINE COMPANY
442 East Gardner Street , , , , Beloit, Wisconsin, U.S.A.

When Jack hangs up his uniform —FOR GOOD...

IT'S been a long time since Jack made his last call as salesman for your *Industrial Supply Distributor! It may be a little while yet before Uncle Sam cancels his present contract . . . the one he signed way back when things weren't going so well for our side.

But after the V-Day excitement has all died down . . . after this war situation is finally settled for once and for all . . . you can be sure Jack will see that you receive the same efficient, courteous service as before.

In the meantime, your *Industrial Supply Distributor is doing everything in his power to take care of your needs both quickly and efficiently. It's not always easy to have just what you want in stock at the time you need it, so you can help him serve you better by ordering as far in advance as possible.

For equipment, materials and supplies, don't forget to . . .

Telephone your I S D* FIRST!

ARMY NAVY

ARMY E NAVY

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49TH STREET
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MAGIC CARPET STITCHED WITH RIVETS

●Landing a big gun on "Subway" portable steel landing mats.

●"Hy-Power" hydraulic riveters as used at the plants of Irving Subway Grating Co., Inc.

On many of the toughest jobs of quick construction it is "Subway" grating that makes a carpet of durable steel over shell crater or ditch, swamp, or beach for safe handling of fast moving motorized equipment. It has been used for temporary roadways, bridges, airfield landing strips, and many other important purposes. When built up of Hannifin riveted sections, "Subway" grating is strong, stiff, yet easily handled.

The secret of fast production at the plant of Irving Subway Grating Co., Inc., is the Hannifin "Hy-Power" hydraulic riveters. The exclusive "Hy-Power" riveter operation combines fast, easy handling and tight, uniform rivet application. The automatic cycle is push-button controlled, and operates at high speed. In addition to production riveting, "Hy-Power" equipment is being used for punching, press-assembly, and other work involving the application of pressure. Write for "Hy-Power" Bulletin 53, or consult Hannifin engineers for specific recommendations.

HANNIFIN MANUFACTURING CO.
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"HY-POWER" RIVETERS · PUNCHES · PRESSES

PRODUCTION PERSPECTIVES

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

WAR PRODUCTION: After several months of coasting at 2 to 4 per cent below schedule, war industry was jolted late last month by news that ammunition is being rationed on the European front, that 28 per cent of the total war program is "critical"....Upshot was a continued damper on spot authorizations for reconversion, and complete readjustment of V-E Day reconversion plans.

SOLUTION: Critical analysis reveals that 200,000 additional workers in a half dozen industries and delivery of machine tools for the ammunition program would enable "scheduled output" all around....Tired of seeing the Army crack the whip over all industry when sharp-shooting is needed, WPB Boss Krug is applying his own plan of selective encouragement. Pressure is being concentrated on "behind schedule" industries. These include trucks and truck tires, foundries, super bombers, wire, machine tools and ammunition.

RECONVERSION: In a startling November 28th reversal of V-E Day plans, Washington now foresees only 2 million war workers instead of 4 million released when Germany falls, continuation of all manpower controls. Armament output will drop only 15 to 25 per cent, not 40 per cent as predicted in September. Reconversion will take a sock on the chin, with "spot authorizations" emphasized and few of the 350 orders WPB planned to drop after V-E Day discarded until Tokyo calls quits.

MACHINE TOOLS: Further complicating the machine tool builders' postwar market outlook is British bickering over disposition of $120,000,000 worth of lend-leased machines. Using this as a test case, the Surplus War Property Administration is offering them to Britain on an all-or-none basis. British want to keep 25 per cent of the machines, return the remainder to the U.S.

POSTWAR PLANS: Some machine tool builders will introduce new products. Several Cleveland builders have purchased patents for other manufacturing equipment....Ammunition program requirements have pushed civilian orders back again, with earliest promises of delivery ranging from 2 to 4 months.... Detroit, largest domestic postwar machine tool market, will strongly influence future machine design. Speaking at the PRODUCTION Round-Table (see page 104), Detroit buyers and users revealed their future requirements, predicted a trend toward more automatic, special equipment.

AIRCRAFT: Cuts planned in overall 1944 program have been set at about 6 per cent, leaving a schedule of about 75,000 planes for next year....Don't look for cut-backs if you're on big bomber work. Pressure will be applied on Super-Forts and heavy transports....Now slowing down, Ford's Willow Run has turned out 6,850 4-engine bombers in the past 2 years, 4,600 in the past 12 months. Automatically solving the plant's excess manpower problem labor is now "drifting away" at the rate of 1,400 employees weekly.

AUTOMOBILES: Programs for increased postwar output are clarifying. Typical is Chevrolet's largest-volume-in-history plan which calls for 400 cars and trucks an hour, with 3 shifts of 7½ hours each. Around-the-clock production and a 7-day week in "slow" departments will permit doubled annual output without greatly expanding plant facilities....Both Chevrolet and Ford have bottleneck foundry expansion and modernization programs under way.

OUTLOOK: Civilian auto production planning is nearing completion. Builders are placing materials and parts orders on an if-and-when delivery basis.... Big worry is not March and after delivery dates on machine tools, but 7 to 8 months required to build big presses lost to other war industries....Don't be fooled by the "autos early next year" stories. The Motor Capital is jam-packed with war work, now leads the nation in war contracts held. Eleventh in population, this area now holds 12.3 per cent of all war orders.

HOW TO CUT THREADS IN THE NEW AGE

ARE YOU PLANNING TO USE NEW MATERIALS AFTER THE WAR?

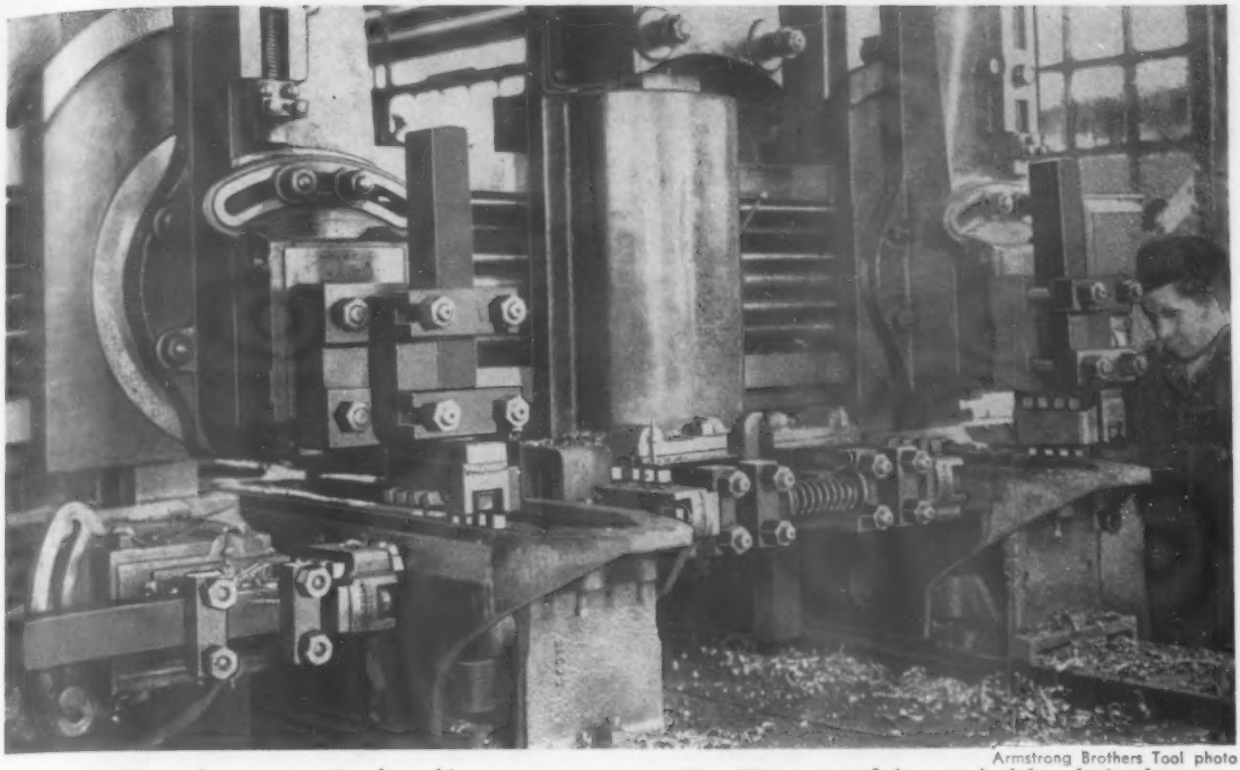
Experimenting in the threading of materials that are new to you can be an expensive, time-wasting process.

Magnesium, aluminum, various plastics, and other materials which are being used more and more widely require individual threading shop practices. The Greenfield Tap and Die Corporation has had wide experience in threading all kinds of materials and is ready to help you select — quickly and efficiently — the proper threading tool and gaging setup for your product.

SIMPLY CALL "THE GREENFIELD MAN"—THROUGH YOUR GREENFIELD DISTRIBUTOR.

GTD GREENFIELD

GREENFIELD TAP and DIE CORPORATION · Greenfield, Massachusetts



Armstrong Brothers Tool photo

Gang planer tool setup, removing four chips at a pass, may save 50 to 75 per cent of time required for planing large castings with single tool. Heads swivel within limits for different sizes of cuts, answering to different feeds.

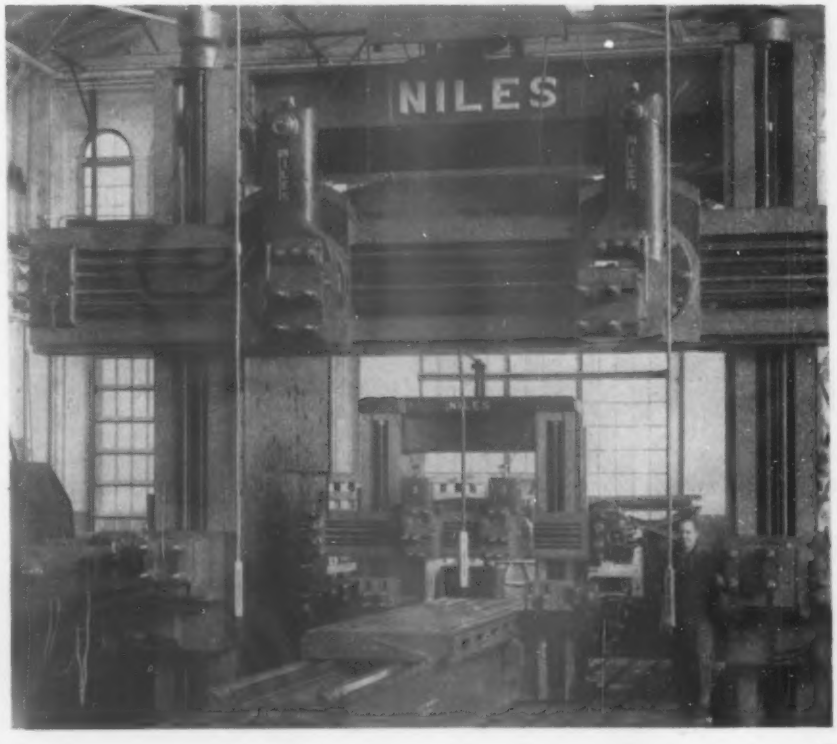
MORE PLANER WORK IN LESS TIME

JOHN E. HYLER

MODERN MACHINES, tooling devices and accessories are streamlining planer operations. Increased stamina and rigidity permit use of heavy feeds for fast roughing—improvements which have gone a long way toward breaking bottlenecks at the planer. Not infrequently, a relatively few heavy-cutting jobs can tie up an underpowered planer for a large share of time.

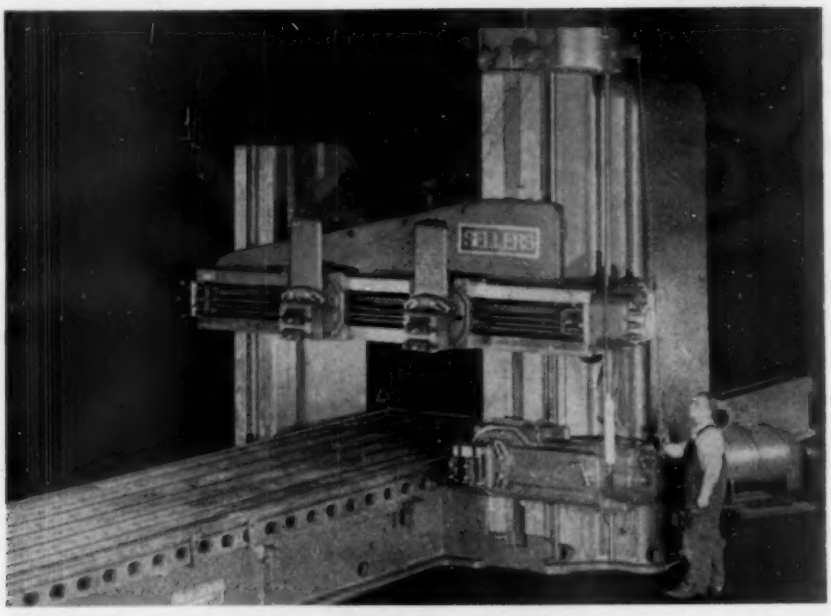
•

Improved drives supply higher cutting and production speeds. The variable-voltage drive provides every



An advantage is gained in many metal working shops by carefully selecting a planer, or group of planers, perfectly adapted as to size, for the work to be done. Shown here are two planers in a line which offers a wide selection.

Niles Tool Works photo



Motor set at an angle with planer table powers a drive shaft extending obliquely across the bed. Motor can be seen behind operator. Obliquely mounted drive shaft carries a spiral gear which engages a rack, giving smooth table action.

cutting speed desired and fast table return. Other advances include better gearing. One development is the reversing motor which has only three gears and a rack between it and the table. Set at an angle with the bed, the motor powers an obliquely mounted drive shaft through a pair of helical reduction gears. Mounted at the far end of the shaft is a special spiral gear resembling a worm, which lies diagonally across the special rack. It engages in such a manner that at least seven teeth of the rack are in constant contact with the spiral gear. Rack teeth are cut at an angle calculated to eliminate side thrust on the table.

One class of large planers is provided with a 6 to 1 speed variation in a comparatively slow speed d-c motor, running at 150 to 900 rpm. Table speeds range from 19 to 115 feet per minute, a sufficient range for heavy work.

Extending planer sizes is possible by opening tables at the center joint. An additional section of planer rack is inserted and supported by a heavy accurately machined bracket. Long tie bolts hold the table halves in alignment. Certain manufacturers furnish openside planers with an extended cross-rail, carrying tools beyond the table. If it is necessary to support the work beyond the table, supplementary rolling tables are provided.

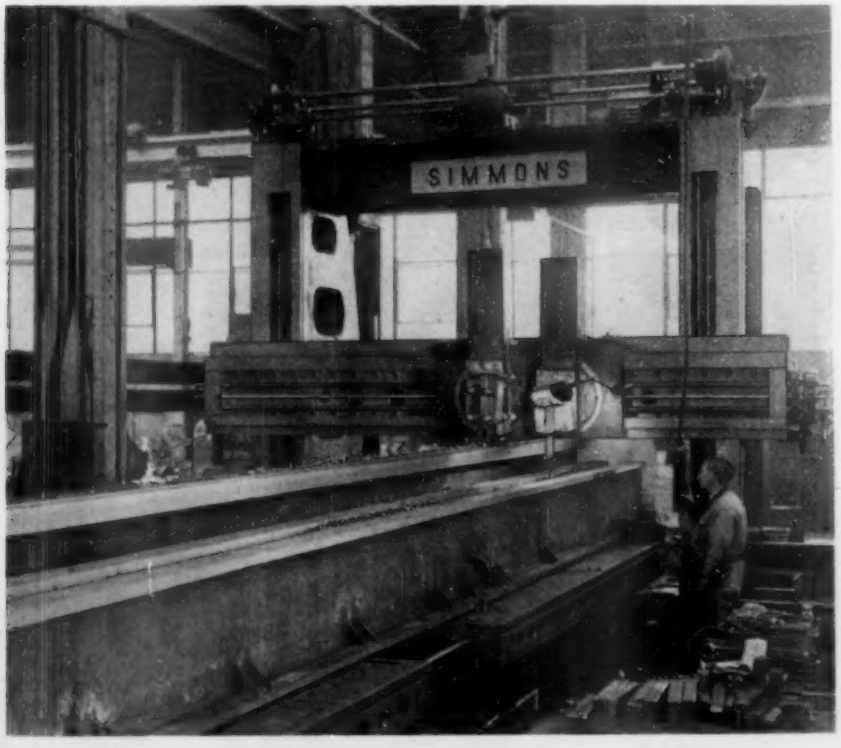
Long slender work should be planed in multiple wherever produced in quantity. Special planers have been fitted so that a number of workpieces can be quickly lined up with multiple tools, the tools having first been set by special guides.

Where an internal radius is to be machined on standard work, it may be handled through the use of a swinging toolhead. Frequently, two swinging toolheads are linked so that one swings the other, making it possible to plane two radii in two pieces of work, in the same setup.

TWO TYPES OF SPECIAL TOOLS

Special tooling concerns mechanical design of tools and appliances and the possibilities for using carbide-tipped tools with high cutting speeds. When using carbides, a planer must be provided with an automatic tool-lifter to clear the work on the return stroke. Dragging cannot be tolerated.

Where jobbing work involves only one or two setups, versatile tools offer the greatest timesaving. One tool is in the form of a shank with an eye at the working end, through which is set a clamping pin that supports the cutter. The cutter can be made fast at various angles, which permits working to several odd angles



Length capacity of a planer can be increased with a little ingenuity. This standard machine with a 40-foot table was required to plane a 45-foot machine bed. To save two setups, and likely inaccuracy, table length was increased by opening it at the joint shown.

An additional section of planer rack was inserted and backed with a heavy, accurately machined bracket. Long tie bolts hold the table together and in perfect alignment.

Simmons photo

and cuts without shifting the work. Where jobs are slow to cut, because of the difficulty of getting at the work with a tool incorporating sufficient strength, especially strong elling tools are provided with some planers.

Delay on undercutting jobs is often caused by tool breakage, such as occurs on the return stroke, when the tool becomes wedged against the surface being planed. Tools are now made free to pivot in the holder on the return stroke, and are positively returned to cutting position by a flat spring.

DOUBLE-CUTTING TOOLS

Forming tools in multiple setups have speeded roughing on the planer. An example of such a toolholder is one which carries 21 separate tool bits. Each tool is designed and set to do its share of the work, and each is secured individually in the toolholder.

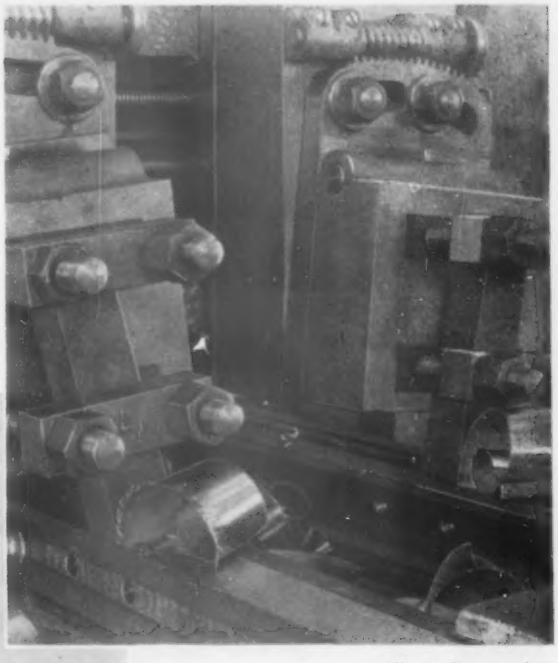
Of course, gang planer tools may save from 50 to 75 per cent of the time required by a single point tool. Double-cutting tools, working on both strokes of the table, offer further possibilities.

Aiding faster setup are long tables which can be disconnected in the center. While planing is in progress on one table, work can be set up on the other. Auxiliary setup plates are also available which can be quickly

Cincinnati Planer photo

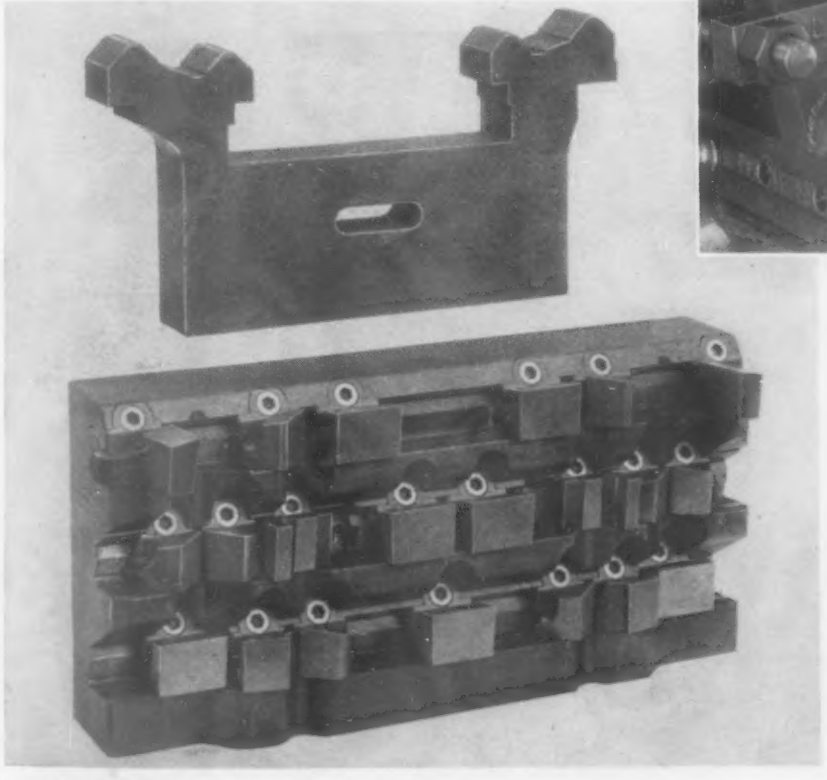
Special planer for machining elevator guide rails, provides for aligning long, slender pieces for gang planing.

Ahead of tools are tool setting guides which pivot out of way. Work setting guides at each end of table, accurately align the work with the planing tools.



Liberty Planers photo

***Above,* sturdy tools are taking heavy roughing cuts—one way of saving time.**



Multiple-bit planer tool shown at the left operates somewhat similarly to a broach. Each of the 21 different tool bits takes its share of the cut, and the planer feed is used to take successive cuts.

The tool was developed for roughing out lathe beds. A cross-section of the work performed by this tool is shown above the tool and holder assembly.

Cincinnati Planer photo

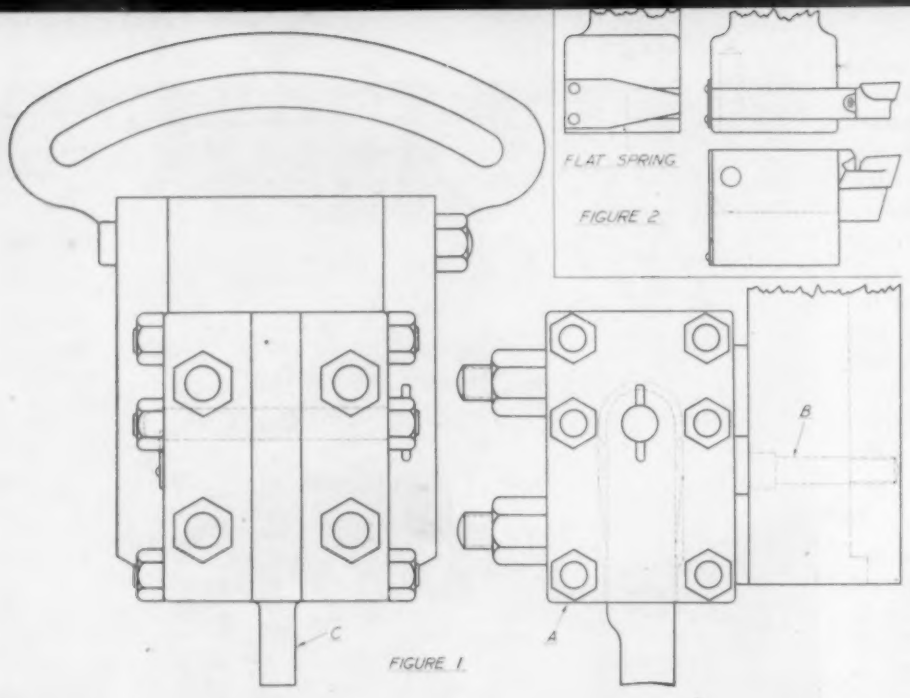


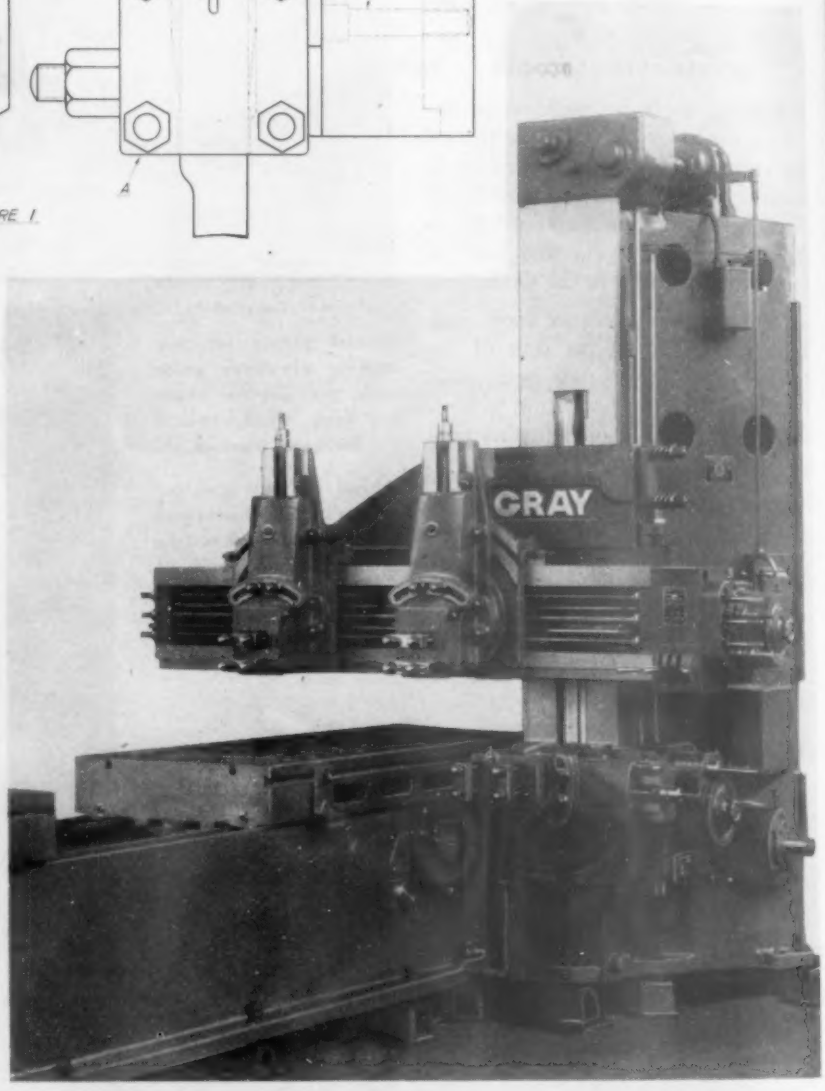
FIGURE 1. Two-edge tool for slotting. Tool block A clamps to apron. Screw B locks apron against lifting. Work pressure pivots tool C against springs so that cutting edge is presented on both strokes. Head feeds at one end only, one edge of tool being slightly longer.

FIGURE 2. Undercutting tool pivots against spring if it meets resistance on return.

Gray drawings

clamped to the regular planer table. They are provided with T-slots, so that work can be set up on them while they are supported on trestles. With work in process on one plate, a second one can be set up. A hoist is used to transfer plates.

Magnetic chucks, of course, speed setup of thin ferrous parts. Fast methods of clamping difficult work to T-slots include special angle clamps, machined at their lower ends to specifications. T-slot nuts are usually more economical than conventional T-slot bolts, and may be had in sizes to fit standard T-slots. They are made with a long bearing surface in the slots. Step blocks and adjustable screw jacks should replace haphazard methods and devices for leveling and bracing planer work. And too many shops still try to save

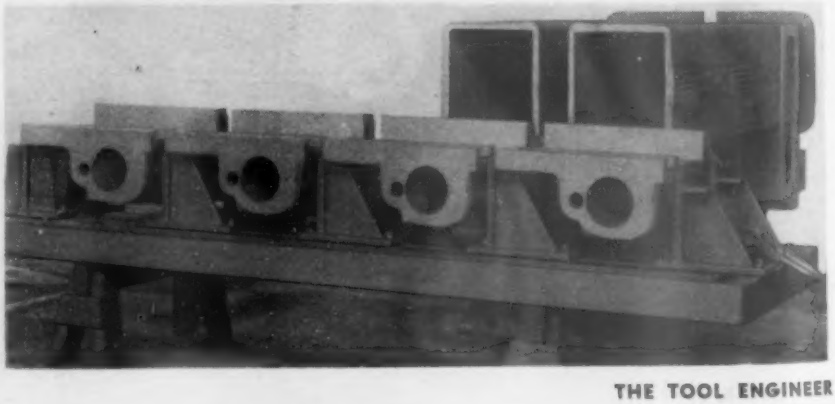


Openside planer is fitted with duplex table. Work can be planed on one half of table while other half is being unloaded and loaded. Note automatic valves in ends of tables, where they join together, which control flow and pressure of lubricating oil to table ways. Such tables can also remain permanently connected, if desired.

Right:

Auxiliary setup plate permits loading off planer table, while machining is in process on similar charge of work on another setup plate. When machining is finished, one setup plate is removed from planer by hoist to a pair of trestles for unloading. Loaded plate is moved to planer and bolted.

Gray photos



Twenty-eight openside Cleveland planers are shown equipped with Turchan hydraulic followers. They are engaged in planing propeller blades to contour from templates. Actually, 39 of these planers are thus equipped in this plant, but 11 of the machines do not appear in this illustration. Note conveyer running between rows of planers to handle the mass output of work.

the cost of a good set of strap clamps, figuring that the operator can find something in the junk pile. While he hunts, the planer stands idle.

Planer parallels, varying in length from 24″ to 36″, prove useful for accurate setup. Width and thickness of close-grained cast iron parallels are held within plus or minus .0005″. Cored holes are located at intervals throughout the length of these parallels, through which clamps may be applied. An aid to leveling planer work is a special attachment applied to a combination square.

Special and odd contour work can be laid out on the end of the work piece, but only a highly efficient operator can turn out a passable job. Cam control is a great improvement, and the Keller control has proven accurate and useful. Hydraulic duplicating devices faithfully reproduce the contour of a pattern incorporating compound curvatures. One type has been installed in a shop on 39 Cleveland openside planers for propeller blade production. Odd shapes may be planed within .001″.

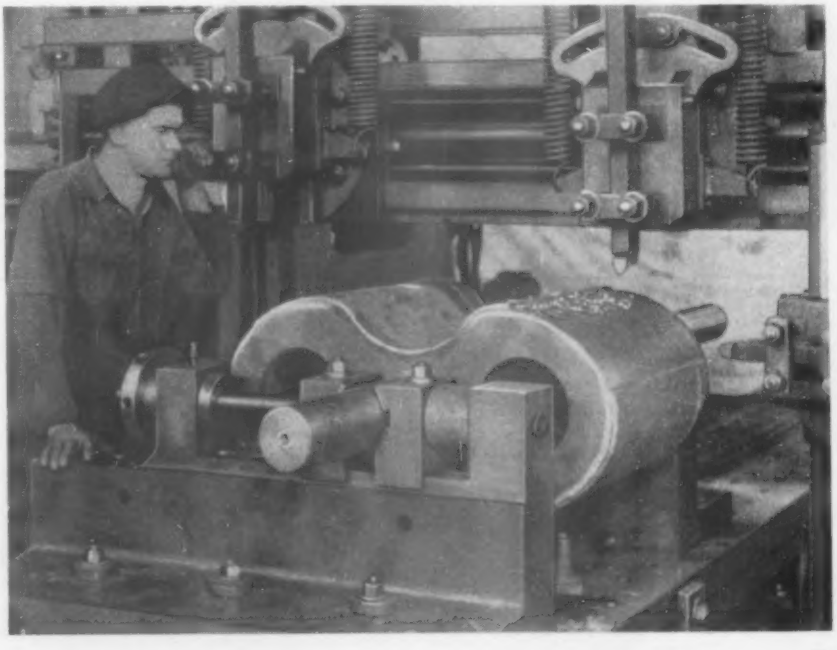
THE END

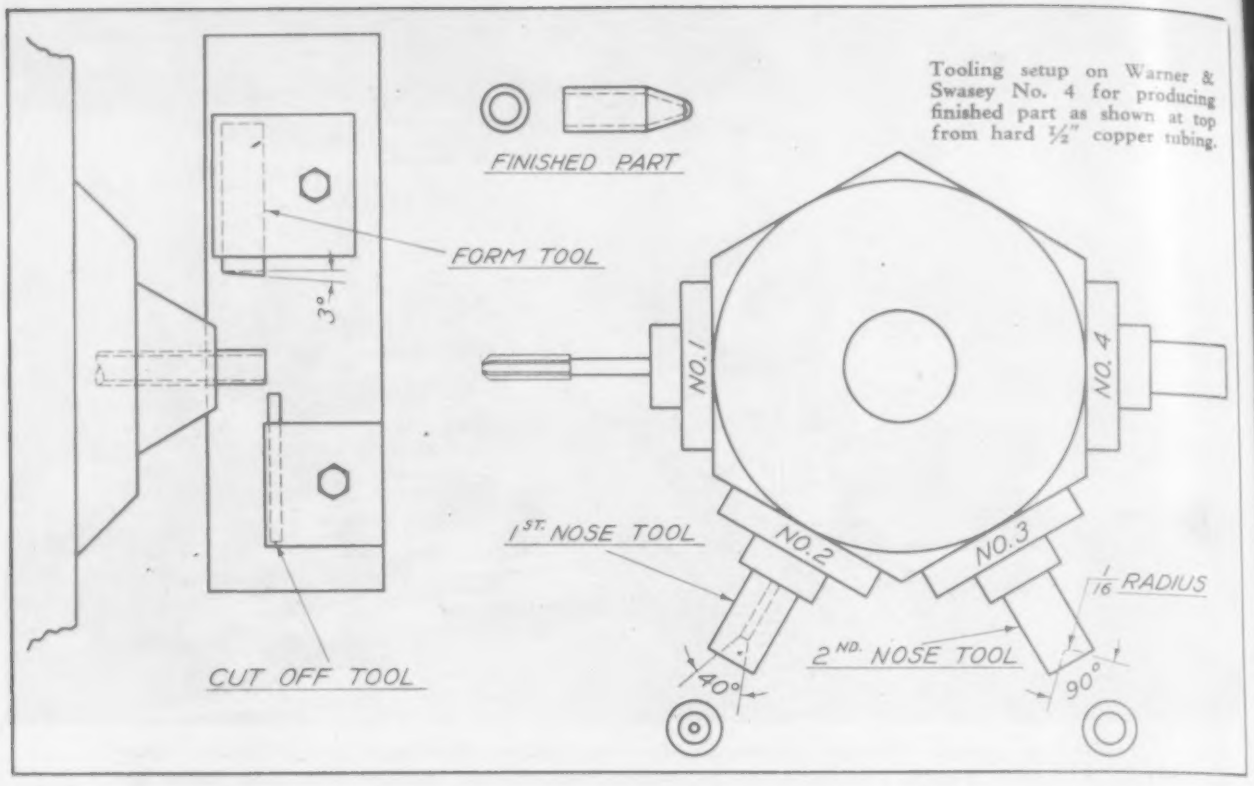
Rotary blower impeller in process of being planed to contour. Template is located behind hydraulic cylinders and machine crossrail. Tracer is linked to hydraulic valve which opens and closes to govern actuation of toolheads by hydraulic cylinders.

Springs shown act as a counterbalance to support weight of toolheads when hydraulic unit is not working. Side head having horizontal motion does not need counterbalance.

Previously, this job was done without contour control, which means setting the tool manually for each cut. It is now done four times faster, and within .001″ on a 72″ Niles-Bement-Pond machine. Tracer control valves used on these hydraulic control attachments are roughly full-floating types of reverse valves. They provide control both ways.

Turchan Follower photos





Tooling setup on Warner & Swasey No. 4 for producing finished part as shown at top from hard ½" copper tubing.

Forming Copper Tubing on the Turret Lathe

AN ORDER of hard ½" OD copper sleeves made from tubing and completely sealed at one end called for high production. Ordinarily, conventional punch and die tooling would be required, but in the absence of such equipment, a standard Warner & Swasey No. 4 turret lathe was tooled for the job.

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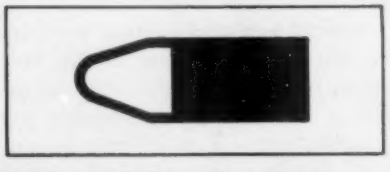
The sequence, as developed for the turret lathe, consisted of six operations.

1. Rear cross-slide: form taper leaving approximately 1/32" wall thickness at open end.



Drawing made from photo illustrates remarkable uniformity of nose cross-section, and complete sealing of end obtained by spinning part into tools installed in turret positions 2 and 3.

2. No. 1 turret: ream ID to desired size.
3. No. 2 turret: rough form nose section of tube.
4. No. 3 turret: close end of tube.
5. No. 4 turret: release chuck and feed out tube to stock stop.
6. Front cross-slide: Cut-off.

All cutting tools were ground with suitable cutting angles for copper machining. A sulphur base cutting oil was used on all tools. The work was rotated at 775 rpm. All turret positions were operated against their respective stops.

The remarkable feature of this set-up was the resultant uniformity which it produced in the nose cross-section, and the complete sealing of that end obtained by spinning the metal into the tools installed in turret positions 2 and 3. The inside diameter was also constant up to the point where the nose begins. A second operation was set-up for burring the open end and ID before parts were released for use. —GEORGE C. BROWN

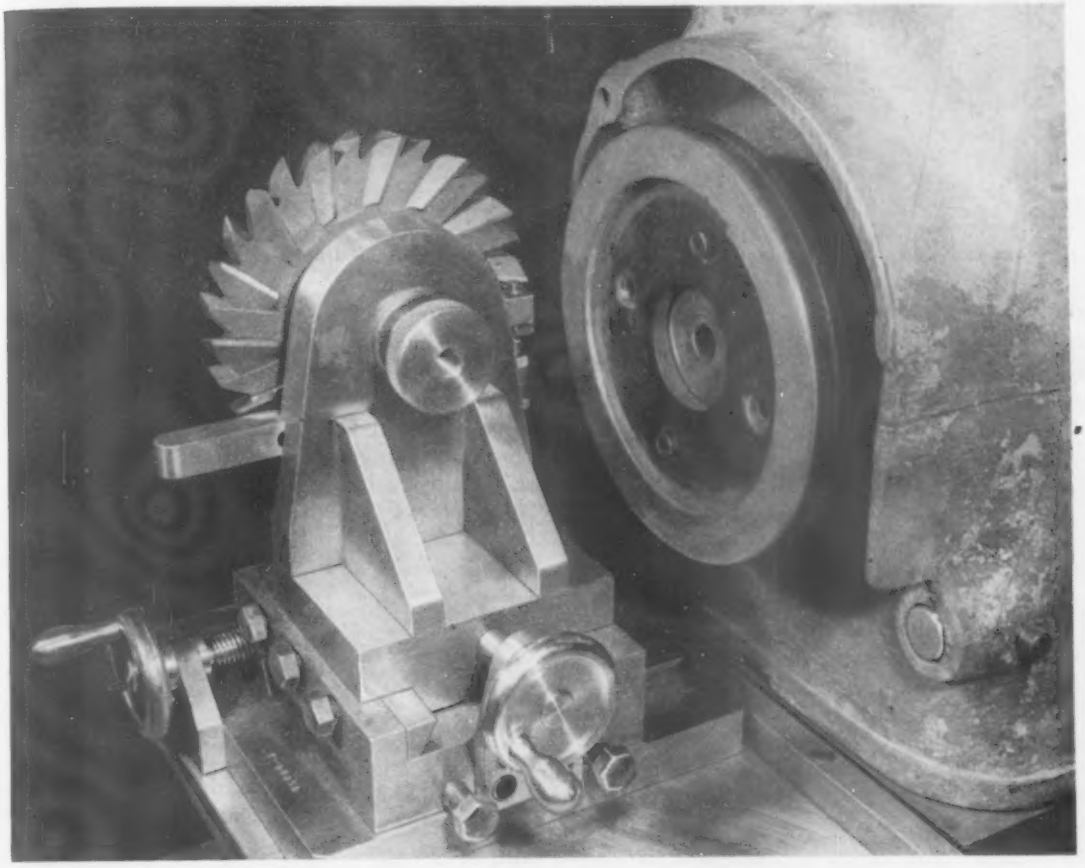
SIMPLIFIED METHOD OF CUTTING MAGNESIUM

• At Northrop Aircraft, Inc., Hawthorne, California, a simplified method of cutting, or breaking, magnesium sheet has been developed. As a result, a thirty minute operation involving the old method is now accomplished in 10 minutes with the new method.

The old method of cutting magnesium consisted of scribing the material and sawing to the line. It was impossible to saw exactly to the scribe line, and the cut always had to be filed or sanded to get the exact dimension. This sanding and filing was an exacting procedure, and if at any time the scribe line was crossed, and the sheet trimmed beyond the dimension, scrap was the result.

The new method consists of scribing the material to the proper dimension, placing it under the brake, scribe line down with the pressure on the opposite side, and directly above the line. With application of pressure, the sheet breaks along the scribe line, clean and true. Filing is necessary only to smooth the broken edge.

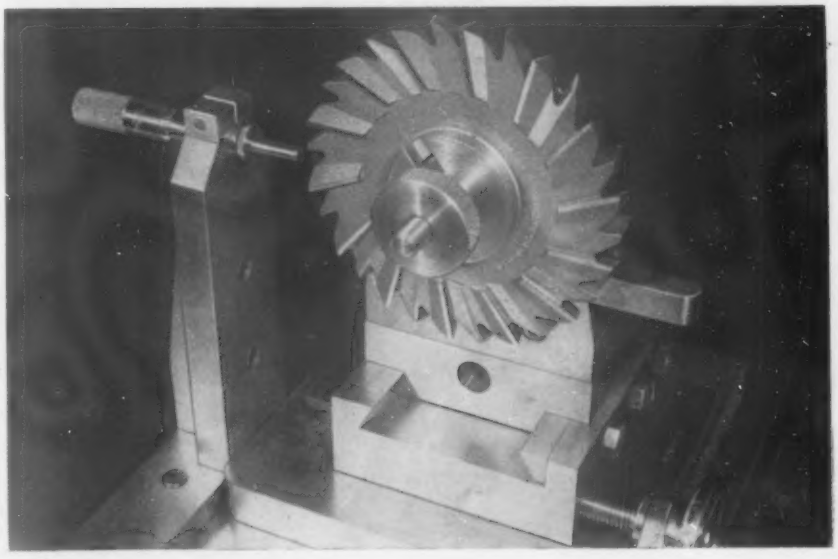
New Machine and Tool Design Speeds Aircraft Parts Output



Flute grinder set up for operation at North American plant. Manually indexed by latch, grinder has an outboard support for work directly beneath the wheel.

North American Aviation photos

***Below:* Micrometer head for grinding fixture.**



GERALD ELDRIDGE STEDMAN

THERE ARE MORE than 700 machined parts involved in the fabrication of the P-51 Mustang. To make high production of this versatile, high-altitude fighter plane possible, North American Aviation, Inc., has designed several unique machines, accessories and devices. Today, this equipment is performing jobs that could not otherwise be accomplished, or is showing improvement over previously established methods.

The overall operation at North American's Inglewood, California plant, where this tooling originated, results in an unusual production and assembly of parts per manhour, per square foot of factory space. It is the type of achievement for which J. H. Kindelberger, North American Aviation's president has become recognized.

To close liaison between shop and

From tool grinding to tube bending, fighting plane builder meets rising production schedules with manufacturing methods which require a minimum of space and skilled man-hours

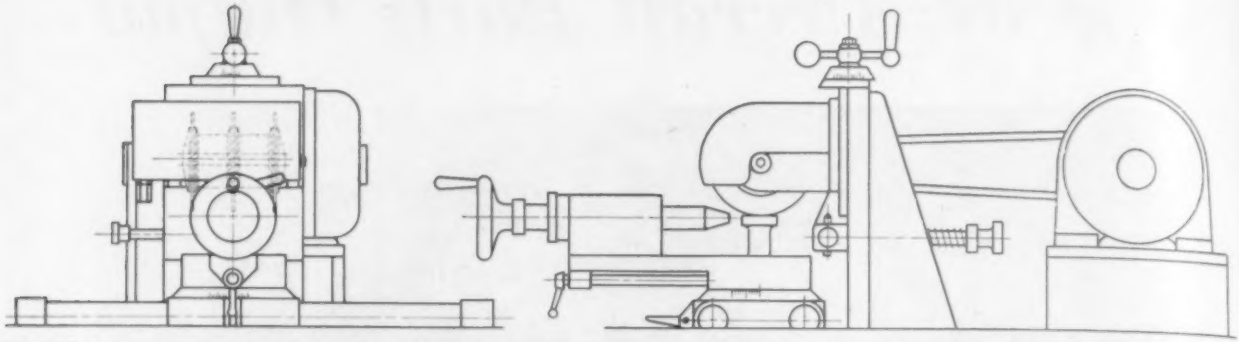


FIGURE 1. Front and side views of grinder show positioning of three wheels and hand-operated diamond dressing fixture.

tool engineering goes much of the credit for the high degree of tooling refinement.

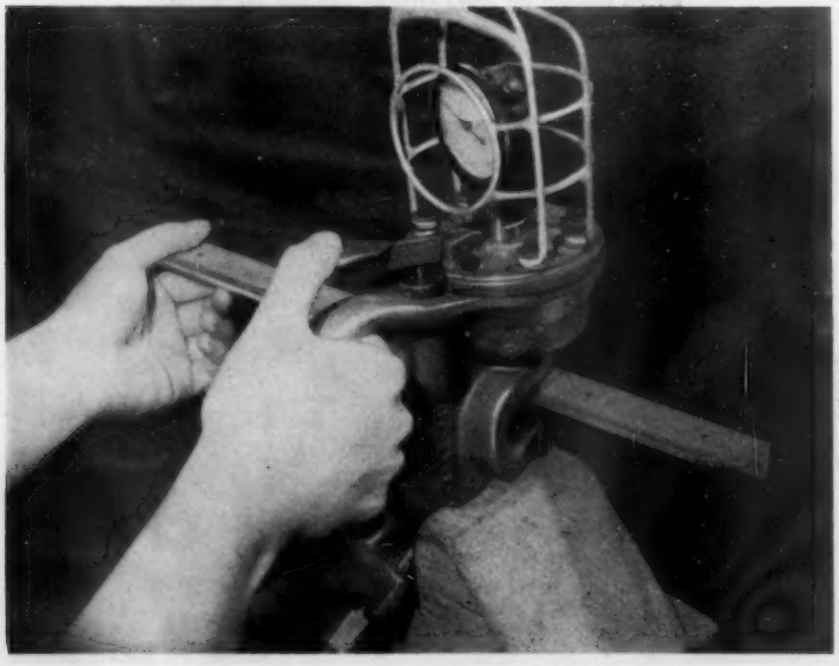
One of the finest examples of recent machine tool design is the grinding machine, which was originated to make drills and cutters. It has a sequence of three wheels, to grind: (1) flutes, (2) lands, and (3) reliefs or anything required. It is manually indexed by latch. It has an outboard support for the work directly underneath the wheel. A manually operated diamond dresser is provided for dressing all three wheels at the same time, though each wheel is serviced by a single tool.

A cam actuates work through the proper lead. Built right in the spindle, the cam is a spiral type and carries the same spiral as is being ground. Machine capacity is 200 drills per day, manufactured from blank rod. It will fabricate or rework drills from No. 40 to 3/8" in size. A micrometer head on the work holder checks diameters.

North American Aviation has developed a small version stretching machine which is perhaps the smallest in use. In fact, the reason for the design, beyond production requirements, is that it was not commercially available.

Another stretching machine designed by North American is a table-type, 25.8-ton capacity. The 96" by 36" table accommodates form blocks to which the work is anchored by clamps. The table is split and can be separated for use in universal stretching of such parts as small bolt angles, and rolled sections. It can be built up to handle sheet.

North American-designed hardness comparator for gaging sheet is air-operated. It follows the principle establishing distance-pressure relationship by penetration. Both bench and portable models accommodate up to 7/16" sheet.



COMPARATOR APPLIED EXTENSIVELY

A recently designed tool having applicability in an entirely different field of fabrication is the air-operated hardness comparator for gaging sheet. Both bench and portable models are available to handle sheets up to 7/16" thick. The principle involved is the same as that employed on the Rockwell comparator, in that the distance-pressure relationship is established by penetration.

Readings are taken off a dial indicator, to which is attached a paper dial face, adapted to the proper values and range. It affords a comparable reading to Rockwell in the aluminum range. The instrument is checked daily with the Rockwell to protect its accuracy against the hazards of portability.

The hardness comparator has been applied so extensively in North American plants that partial production tooling has been developed to meet demand for the instrument. Its operation consists of one cylinder overpowering another to simplify valve arrangements.

An exceptional machine design is that developed for tube bending. It incorporates principles used in several existing machines, plus ideas original with this airplane manufacturer. The equipment performs progressive tube bending semi-automatically by hydraulic action, powered

by a 750-1000 pound pump. It can produce nine progressive bends through an index and stop system, indexing and progressing for rotational, radial and linear bends through three separate stop systems working in synchronization. The hydraulic system actuates the rotation of the head which performs the radial bend. The arrangement includes solenoid valve and limit switch control, working within an accuracy of plus or minus .005″.

The tube bender automatically resets itself in its progressive movement to accommodate linear, rotational and radial operation. Linear movement and rotation are produced manually, by pulling the tube, turning, and backing into the stop.

Also important to tube forming is the tube beader, designed by production engineers in the North American Aviation plants, which handles work of ⅝″ to 3″ diameter. The equipment employs a set of female dies incorporating the outside tube contour of the bead.

The material is pressed into the die by an eccentric, rotating solid tool. Though the heavy-duty machine and fixture are designed for use on aluminum, it can also be applied to beading steel tubing. It is motor driven, pneumatically operated, and works to progressive stages.

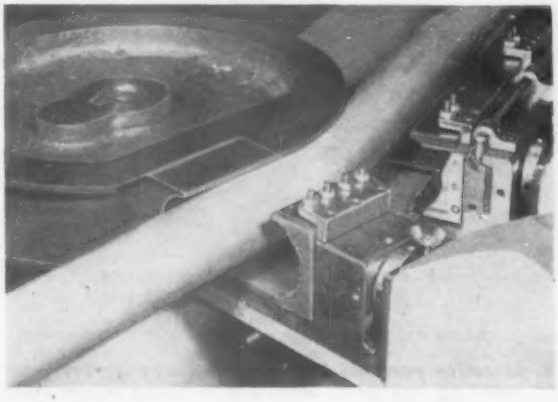
OPERATING PROCEDURE

The steps are : (1) the work is received against a stop, and when the foot pedal is depressed, the cycle of operation begins; (2) work is clamped by the dies, the mechanism moves forward on the ways while the tool is still in neutral position, so that the tool can enter the open end of the tube; (3) the bed contact comes to a positive stop to position the tool, and the air cylinder contacts the end which revolves the spindle, forcing it to move on its eccentric to required depth; (4) all steps are followed in reverse order to the starting position.

All this movement occurs with such speed that 3/100ths of a minute would be a generous estimate of the time involved in the complete cycle. The operation is performed at variable speeds, though the motor runs continuously at 900 rpm.

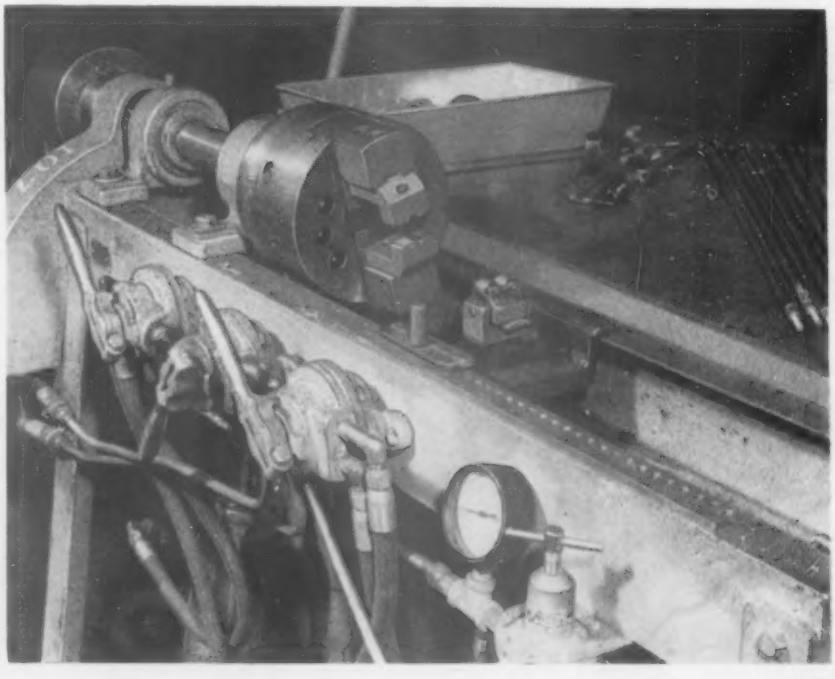
Another unique North American Aviation machine tool design is the pneumatic radial, or "jack-knife" drilling machine, with Delta head and adaptor. The largest table model of

Tube bender incorporates ideas from other machines, as well as original thought. Semi-automatically operated by hydraulic action, the machine accommodates nine progressive bends.



Work is held by air-operated clamp and toggle motion in tube bender. The head is rotated by hydraulic power.

Pneumatically operated proof loader for testing butt weld bend and stress over 360°, accommodating all control rods.



this equipment is 20 feet long. It is used to drill and countersink skin and stringer panels to template location, and is positioned by a locating adaptor. The drill travels on rails adjacent to the table and can be applied to a variety of widths and lengths.

The traveling carriage supports the column from which the radial arm is suspended. The drill spindle is powered by a Delta head, "air-draulically" operated and simplified. An air-oil vapor coolant system simultaneously lubricates and blows out chips at line pressure.

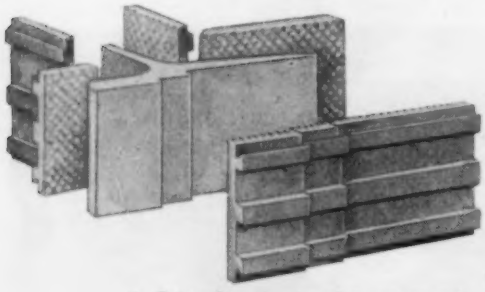
The drilling table accommodates different drill jigs which are hinged in position. The jack-knife swing is a full 360°, with a 30" radial range. Modifications permit straight drilling with or without the adaptor up to 5/16" diameter holes. The motor is 1-hp, turning 5000 rpm at the spindle.

A proof loader for flash welded control rods rests butt weld bends and stress through 360°. The pneumatically operated device rotates the work and applies a specified load at a specified distance from the weld. Work is held in a standard air-operated chuck. A graduated index establishes the test conditions. Three air valves control clamping, loading and rotation of the part. The machine accommodates all sizes of butt-welded control rods.

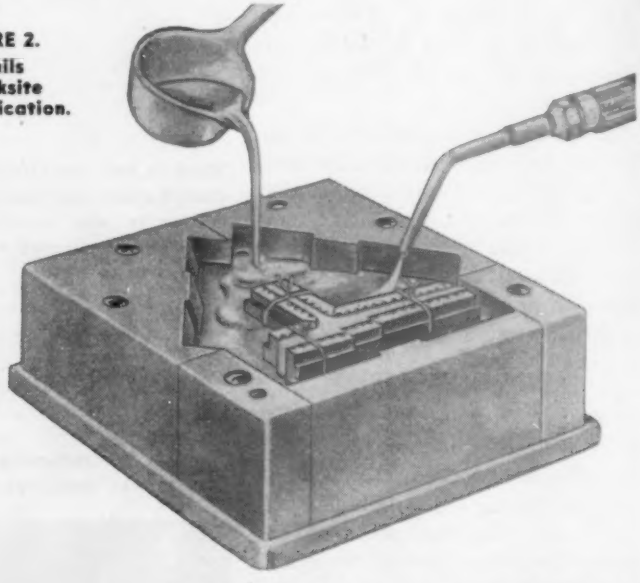
Another development has speeded production of jaws for Sheridan, Hufford and Erco stretch presses. Dies embodying standard jaw inserts, are molded from Kirksite, which has proved sufficiently strong to withstand the pull of machines developing as much as 75 tons. Die inserts were formerly made of steel and the experimental machining and fitting required too much time. The Kirksite die process eliminates all machining, with the exception of sawing jaw segments apart.

Briefly, the technique consists of encasing a section of the actual extruded part in standard serrated jaw inserts. The assembly is locked by wire and dropped into a mold form, which carries the shape of the slides in the body of the jaw housing. Molten Kirksite is poured around the assembly to form the "false jaws", conforming both to the part shape and to the jaw housing shape. The casting is so accurate that thread holes in the jaw need no tapping. The technique produces a complete jaw with backing plate and dovetails in place, ready for use, in four hours. THE END

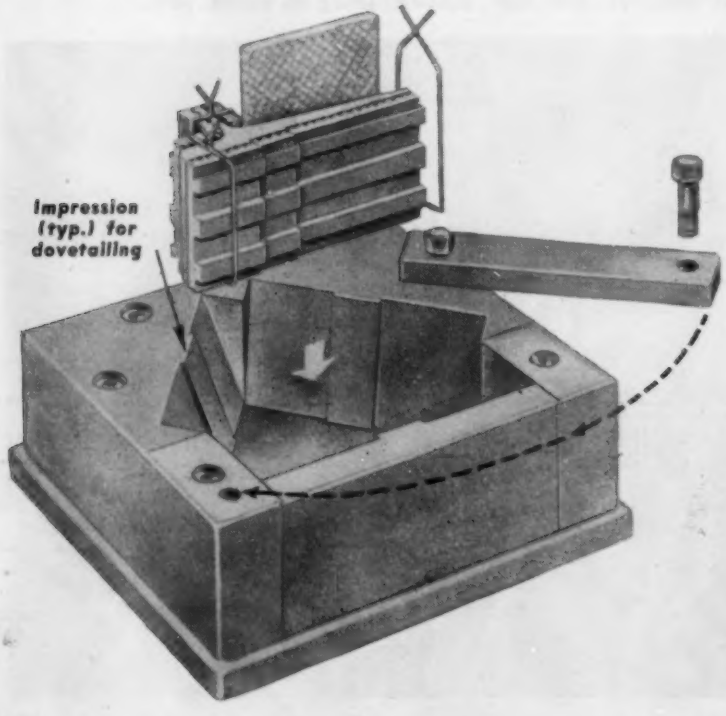
FIGURE 2.
Details of Kirksite jaw fabrication.



1. Extrusion part with serrated jaw inserts ready to be fitted and wired together.



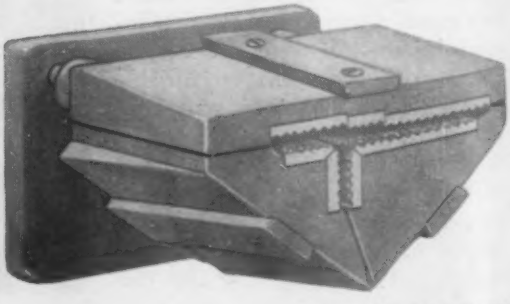
2. Extrusion part and jaws being wired together before lowering into mold. Note bar to clamp insert assembly in mold, shown in open position—(not shown in illustration to clarity).



3. Pour Kirksite into preheated mold aiding flow into sharp corners by use of blow torch. When solidified, fill shrink cavity with additional metal.

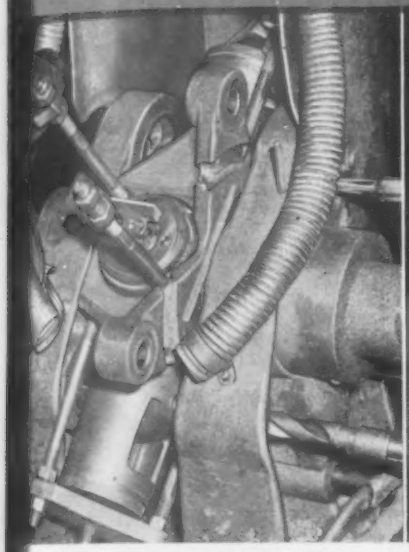
4. Locate, tap and spotface backing plate pegs before separating sections.

5. Complete jaw with backing plate and backing plate pegs and dovetails ready to use.



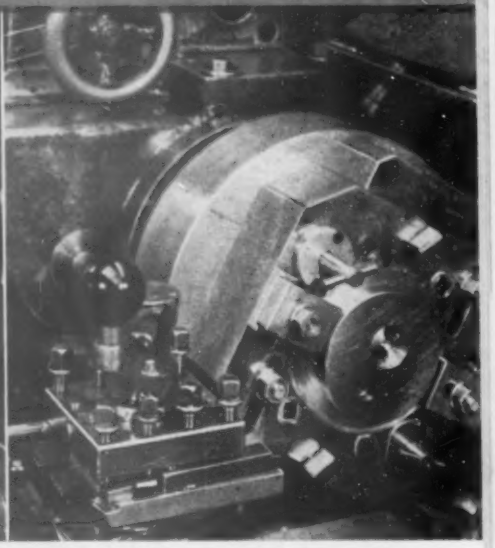
PRODUCTION

MACHINE AND TOOL ENGINEERING



●Semi-automatic machine and fixture set-up permit high output on rough boring ...a holes in pistons. Work loads in in-dexing fixture which revolves between spindles. Page 84—Sealed Power.

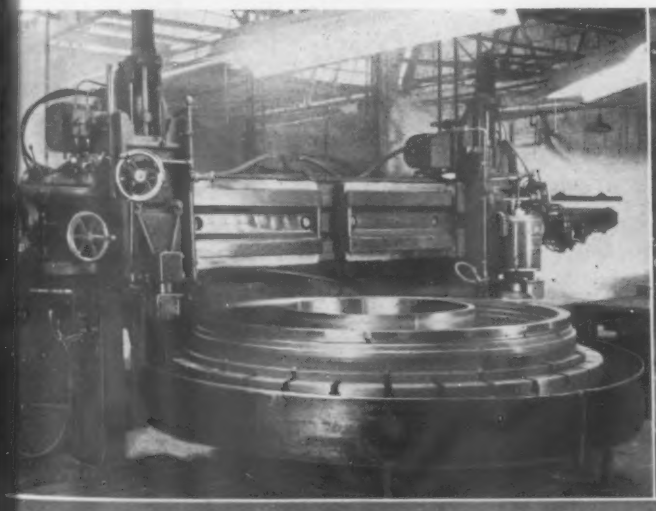
●Rough and finish reaming bolt holes in crankcase. Work loads onto trunnion fixture which is inverted to expose jig plate. Fixture indexes 30° for second operation, unused spindles clearing work. Page 78 —Continental Motors.



●Indexing fixture on turret lathe headstock permits shifting center of circular part so that three holes can be machined within .001" alignment. See page 86 for drawing of fixture and tooling—Bennett Pump.

●Special machine based on boring mill design eliminates handscraping. ...cludes compound cross-rail, precision bearings, and independent ...undations for upright columns and table. Machine has a 100" table. Page 83—Kaydon Engineering.

●Milling light gun carriage. The part is loaded rapidly by means of locating to centers punched in "target" fixture used on previous operation. Streamlining of this type reduces man-hour requirement on Oerlikon gun mount. Page 81—Norge.



500% MORE PRODUCTION WITH ONLY 200% MORE MANPOWER

Muskegon, Michigan, number one critical manpower area, has met tremendous war requirements demanding high output of vital parts, by tooling to overcome the handicap imposed by lack of labor, particularly skilled labor. Following pages detail methods and techniques applied by five manufacturers in this community.

Streamlined Production

500% More Production
With Only 200% More Manpower

THAT MUSKEGON, MICHIGAN, is the country's number one critical manpower area is no reflection upon the production engineers of that city's 57 war plants. With only a 200 per cent increase in working population, the output of this industrial community has rocketed 500 per cent. Nor is the shortage of labor an indication that Muskegon industries have bitten off more than they could chew. The facts are that this city has supplied motors, piston rings, crankshafts, camshafts, gun mounts and plane parts for every major invasion of the armed forces. Its products have been necessary to military progress.

Living with its problems day in and day out, Muskegon's production engineers are not inclined to "note with pride." Trouble with castings, compromises with the unions, the persistent need for more men in many plants, these factors weigh heavily on the minds of production engineers and production managers. Yet, despite these problems, no other community in the United States can claim more credit, few can claim as much, for the machine and tool engineering job that's been done.

Today the working population is approximately 35,000 —about 200 per cent that of 1937. But output is 500 per cent above prewar. Tooling has made the difference, more difference than is indicated by figures alone. The prewar working population was almost entirely male, and was trained to do its job. Of fifteen thousand newcomers, few can qualify in both respects. They have not increased the manpower potential 200 per cent.

•

Improvement in every phase of production has been necessary to the streamlining job that has been accomplished. From special machines to shop kinks, from invention of entirely new processes to improved clamping devices which reduce manual motion, no method or technique has been overlooked as a source for economizing on man-hours.

This article deals with the accomplishments of five plants—four established companies and one new concern. Employment in these plants ranges from 500 to 5000. Companies presented are Continental Motors Corporation, Norge Machine Products Division of Borg-Warner Corporation, The Kaydon Engineering Corporation, Sealed Power Corporation and Bennett Pumps Division of John Wood Manufacturing Company, Inc.

SPECIAL FEATURE BY THE EDITORS

Automatic Machines for High Production

Continental Motors develops special tooling to meet mass production schedule on aircraft-type tank engine. Unskilled employees work to close tolerances

CONTINENTAL MOTORS, Muskegon's largest employer has applied a broad range of production experience to obtain production of several models and types of internal combustion engines. At present it is operating an aircraft engine plant in addition to the original "motors" plant. In the older installation, models produced include a finely finished aircraft type engine for tanks, a 65 hp airplane engine and a large cast iron engine for landing craft.

The 250 hp aircraft-type tank engine, a seven-cylinder radial, air-cooled model, offers an opportunity to study briefly the application of experience which has enabled this large manufacturer to pace engine construction nationally in one of the tightest manpower areas. Though automatic machines are used as much as possible, it can be shown that in high production, close tolerance work there is a place for conventional, manually actuated equipment.

There is also evidence of tooling for expediency, as in setting up an old lathe, originally designed to drill ½" holes, to gun drill 1-⅜" holes in lightening crankshafts. However, this operation has since been put on an automatic machine.

Crankcase and cylinder head manufacture illustrate the most varied activity. In drilling and reaming seven bolt holes for joining the crankcase sections, and in drilling seven mounting holes in the same part, two multiple spindle machines have been set up for each operation. In the second machine, two sets of spindles in the same head are tooled for rough and finish reaming. In this instance, the rotary table indexes approximately 30° for the finishing

operation, the inactive tools clearing between sections of the casting. In drilling, tools are advanced ½" or a preliminary cut, backed out to clear chips, and then advanced to finish the 2-½" holes in the mounting bosses.

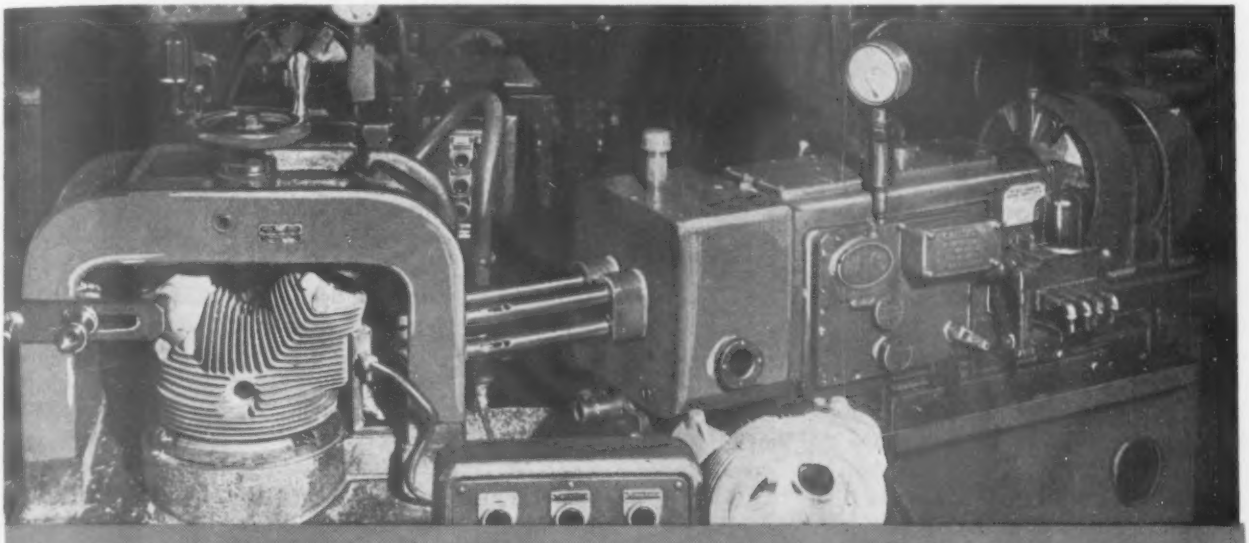
Both machines are equipped with turnover fixtures on the machine table so that the flat side of the work can be mounted easily against the inverted jig plate. It is secured by means of a clamp-ring. The fixtures are rolled over between trunnions, and by means of hydraulic actuation, the entire fixture moves on rails beneath the spindles. Machine actuation is entirely hydraulic. Preliminary to this operation, a locating hole is drilled in the case for alignment with a pin in the fixture.

In rough boring cylinder barrel openings, a Baker vertical spindle drill press is used with a vertical indexing fixture. A cut of ¾" on the diameter is taken off the 5/12" bore. For such heavy stock removal and the accuracy required, a thrust bearing above the bushing and a heavy bushing of approximately 10" length is used. Surfaces are finish bored on an automatic boring machine, employing a horizontal rotary plate for indexing purposes.

A 2-spindle, horizontal, special-purpose machine, with complete electric control of hydraulic actuation, bores and taps intake holes on cylinder heads. Heads are mounted on a rotary table for indexing between spindles. Seven motors, ranging from ½ to 2 hp. are controlled by relay switches. Two motors are connected to shaft gearing, and five to powering pumps for spindle advance, reverse, and work indexing.

Because tapping aluminum precisely requires careful control, automatic operations generally require use of a lead screw. To meet this requirement inexpensively, in one instance, Continental has applied an ingenious accessory to a small drill press. An auxiliary spindle, with a lead screw provided, revolves between opposed brass pins which are actuated to close against the lead screw so that the spindle cuts its own lead. Two machines, one for tapping a 9/16" hole, have met the production requirement in the auxiliary crankcase. Only machine maintenance consists of cutting a new lead about every 10 days.

In boring seven holes on the auxiliary crankcase to a tolerance of .001" between holes, a multiple boring fix-

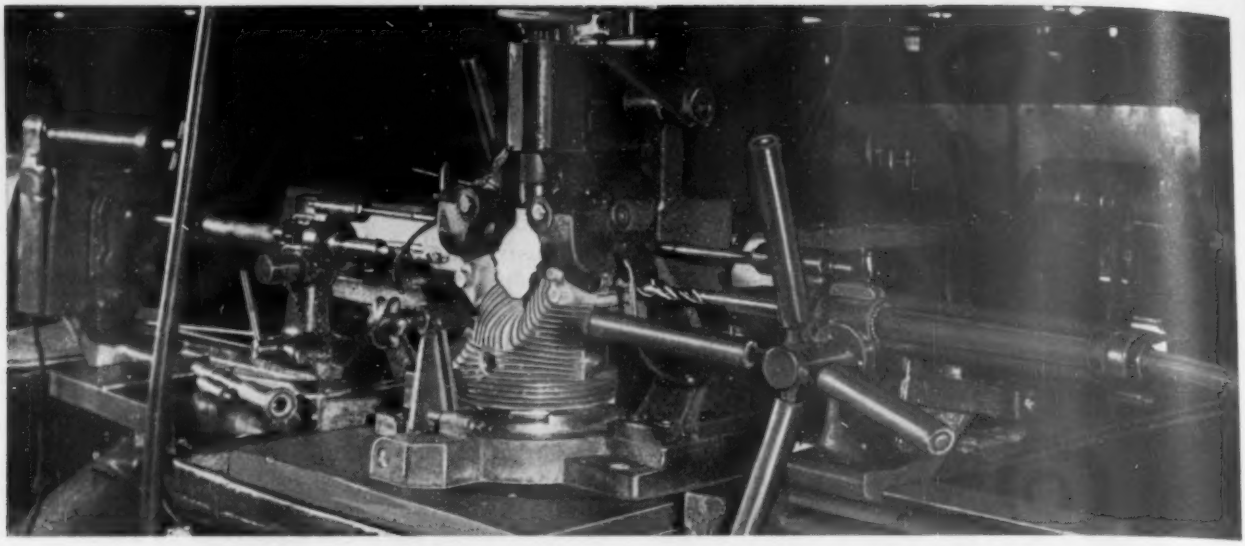


Two-spindle horizontal machine for boring and tapping intake holes on cylinder heads. Hydraulic actuation is automatically controlled by electrical circuits. Seven motors—½ to 2 hp—are controlled by relay switches.

Continental photos

Auxiliary lead screw fixture for precision tapping, mounted on standard drill press spindle. Fixture consists of opposed brass pins which close against lead screw so that machine cuts it own lead.

Brown & Sharpe No. 2 automatic converted to threading studs. Tool turret is equipped with three expanding die heads and three stock rams. Magazine load feeds studs to loading position.



Special two-way machine for drilling oil holes between angles of cylinder head, designed by Continental Motors. Fixture provides for automatically drilling holes to correct depth, independently of casting variations.

ture has replaced seven men. Features of this setup are a spacing between boring bar bearings of approximately 15", and universal joints between the gearhead and the first bearing. Chrome plated bars last approximately three times as long as others. Approximately .040" is removed to meet finish specifications. The work is located from a center shaft hole.

AUTOMATIC 6-STATION MACHINE

Where eight automatic turret lathes were used to bore inside the cylinder head and perform a radial cut on the dome, a single automatic, six-station indexing machine performs the job. Previously, it had been difficult to meet the production requirement. Tooling on the new machine for finishing the cut on the dome incorporates use of a geared toolhead which swings the tool through a radius. On the automatic lathe, this had been accomplished by advancing a ram from the cross slide bar against a spring mounted tool in the turret. Because of the sensitivity of the automatic machine, one turret lathe is still maintained for hogging metal on oversize castings.

HAND-CONTROLLED PROFILER

In profiling between finned sections of the cylinder head, around the intake hole, a hand controlled machine has replaced automatic actuation. With spindle advance incorporating automatic depth control, all that is required of the operator is to guide the follower through a cam path. Rough and finish cuts are performed on the same machine, a .0001" shim being removed from the spindle stop for the second operation.

An automatic eight-station machine has replaced three hand operated 2-way machines used in drilling, reaming and counterboring two spark plug holes in the head. Each part is run twice through the newer machine, hand indexing following completion of each cycle. A 40 per cent increase in production resulted.

Streamlined Production

Machining valve head holes, including counterboring the seat for the hardened insert to pre-determined depth, was to be performed on a special purpose 8-station machine, with the work indexing through a vertical plane. Accuracy could not be maintained however, and it became necessary to improvise tooling with old equipment. The job is now performed on two rebuilt turret lathes and two single spindle drill presses, each machine employing indexing fixtures for the two positions required. In reaming the valve guide holes, the work is mounted in an indexing fixture which is secured to the saddle, and which replaces the turret.

Piloted tools are run into the work through a bushing, and the work and tools are advanced to the headstock and collet. In counterboring the valve insert seat, with .002" depth control, the work is seated against the valve seat, which has been machined with relation to the dome in the combustion chamber. A floating stop contacting the radial dome, permits spindle advance to the point where the stop fits snugly.

Until recently, oil line holes between angles of the cylinder head have been tediously drilled in single spindle presses, incorporating the use of box jigs. A hand controlled, two-way machine has been constructed in the Continental tool shop which offers higher production and greater accuracy in counterboring to leave a specified thickness.

AUTOMATIC DEPTH CONTROL

Previously, thickness has been gaged by hand. This was required because castings vary slightly. On the two-way machine, opposed spindles are advanced into the work, with guide pins providing depth control through a simple but ingenious mechanism in the central locating and holding fixture. A plug which fits into the combustion chamber carries two floating buttons which rest against the bottom of the hole to be counterbored. The buttons are part of a rocker, the other end of which is contacted by the guide pins. As the guide pins strike the rocker, spindle advance is stopped. However, because of varying casting thickness, it may be necessary for one spindle to continue its advance slightly. This is made possible

by provision in the design of the draw bar which actuates spindle advance from a common worm. By application of slightly extra pressure one spindle can continue to advance through a telescoping of the draw bar against spring pressure.

Progress in small parts manufacture is well exemplified in the conversion of a No. 2 Brown & Sharpe automatic to threading three studs with each complete cycle. The tool turret is equipped with three stock rams, alternating with the expanding die heads.

Studs pre-cut to length on another automatic are fed from a magazine load. The magazine advances by cam action. The ram pushes them into the collet, the turret turns and the chaser advances. Upon expanding, and returning the turret turns, and the chaser is closed by passing a dog on the machine bed.

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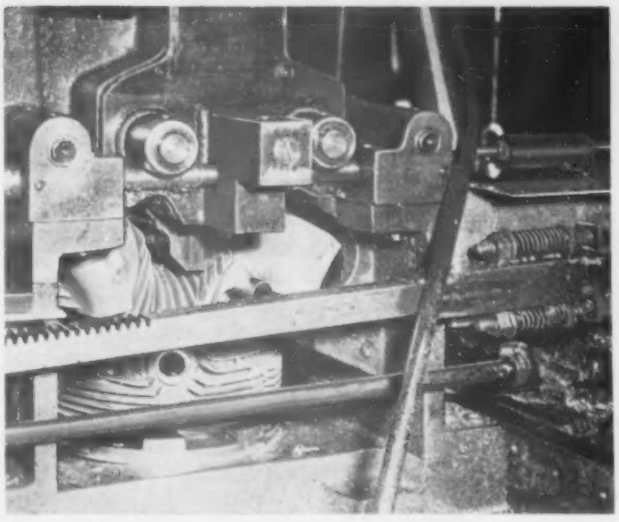
Through an extensive program of tool control and tool salvage, executed through specified supervision, Continental has saved thousands of man-hours annually. The objective has been to educate shop foremen to methods which will reduce the number of tools required on any job, to watch tool selection, and tool handling.



Draw bar linkage on special two-way drilling machine is such that one spindle can operate independently of other. By application of slight additional pressure, one draw bar telescopes within other, against spring pressure, in event that one tool has advanced to stop position.

Fixture Designs Simplify Operations

Norge machine shop tools for manufacture of Navy gun on standard equipment, with emphasis on the idea that an idle man costs more than an idle machine

FOLLOWING THE PRODUCTION of some 20,000 heavy-type Oerlikon gun mounts, Norge Machine Division of Borg-Warner Corporation has converted its facilities to the manufacture of a newer, lighter mount. With this changeover, substitutions have also been made in machine tools, a large percentage of almost ancient models being replaced by recent design machines.

The approach to the manpower situation in this plant is best indicated in a brief description of operations sequence, fixture design, and materials handling methods.

An idle man is considered far more costly than an idle machine. In the same sense the idea of balancing operations carried greatest emphasis on balancing expenditure of man-hours between the various operations.

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The present gun mount calls for manufacture of a dozen major items. Of these, the tripod-like weldment which forms the foundation for the mount mechanism is supplied to the Norge company. A minimum of machining is performed on this item. Main jobs, consist of machining the carriage, pivot, pivot-housing, gun slide, and assembly components. Manufacture is divided roughly into six groups. Five groups are identified with parts such as the carriage, a steel casting weighing approximately 100 pounds; the pivot which is an upset forging, of about the same weight; the pivot housing, a malleable casting weighing about 110 pounds; the gun slide; and small parts. The sixth group includes final assembly and packing.

A group of short lines are used to fabricate such small components in the fifth group as the ring which holds the pivot in the pivot housing, and the spring balance assembly.

The approach to fixture design for machining large parts has been one of simplifying manual operations, and producing accurate parts. Machines have not been counted upon generally for accuracy so much as the fixtures which hold the work. An excellent example of a fixture which has reduced setup time and provided required accuracy is used for rough machining the carriage casting on a turret lathe, where several conventional boring, turning and facing operations are performed on the turntable ring.

By setting the part up in a target fixture, off the machine, both man-hours and machine time are saved. The target fixture is clamped to the work with reference to several locating points on the casting in a much shorter time and more accurately than would be required by mounting with reference to dogs and stops on the face plate of the lathe. In the first place, it is much simpler to mount the part on a bench, in a convenient working position. Threaded pins are adjusted to set depths on locating surfaces before clamping the fixture to the work. The assembly of fixture and work is quickly located and clamped on the face plate by means of a ring, concentric with the surfaces to be machined. Two machines are maintained in steady operation by one operator. Parts feed between the machines on a roller conveyer.

LOADING SPEEDED WITH "TARGET"

The target includes two templates which provide location for a hand punch operation to indicate centers for straddle milling the bosses on the arms of the carriage in the second operation on the part. When the first operation is completed, the target is removed and the part is then placed on a fixture which includes clamping the machined ring to a swivel plate. A hinged template swings up between the arms to align the work according to the punch marks.

Streamlined Production

With the base of the carriage clamped to the swivel ring bed, support must be given the arms which tend to spring under both cutting and clamping pressure. Supports include two angled blocks, with serrated surfaces, which slide under the arms, raising them slightly to an indicator position. Clamps are then tightened down from above, pressing the arms against the serrated blocks to original indicator zero position. Surfaces are roughed on one machine, finished in a similar setup on a second machine.

Other surfaces on the side of the part are milled on a Cincinnati Hydromatic.

Remaining operations employ drilling equipment both with single spindle and multiple spindle machines. A feature of drill jig design is the provision of extra long bushings for accuracy. Two operations include the use of rotary tables, one to facilitate loading on a multiple spindle operation. With two parts in process for drilling and countersinking, each in a separate fixture, the indexing setup permits pre-loading and unloading a third part. In the second instance, a rotary table is used to provide a radial action for profile milling a ledge above the swivel ring and between cast ribs.

TRUNNION FIXTURES CRITICIZED

In another instance, a multiple spindle drilling head is set up to perform identical operations simultaneously on opposite sides of two carriages. Two fixtures are provided in the place of the more conventional turnover or trunnion fixture. Where high accuracy is required, thinking in this plant leans away from trunnion fixtures. Factors which have weighed against their use are the wear in pins, bearings and axles. Single fixtures, welded up from steel plate are solid, offer no maintenance problem.

Only moving fixture in use at present is a rocking fixture, used in drilling two oil holes, where high accuracy is not paramount.

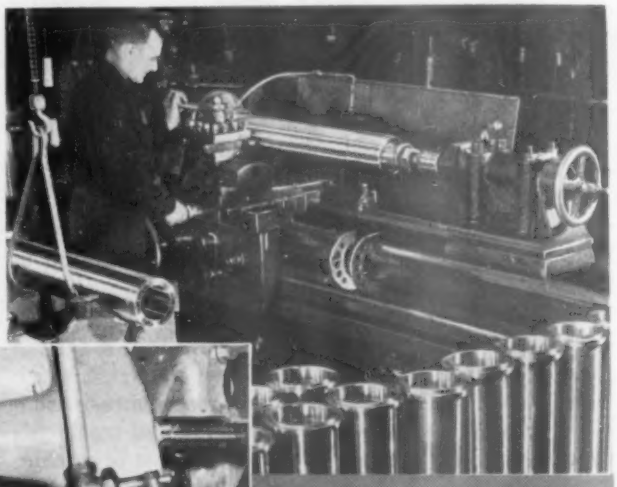
Several short parallel production lines, all fed from one end, are equipped with a variety of equipment, such as turret lathes, automatic lathes, drill presses, thread millers and grinders, to produce other parts of the carriage. Cylindrical grinding of the pivot employs a large wheel, the edge of which finishes the cylindrical surface, and the side of which is dressed to face grind a flange in the same operation. Perpendicularity of the flange to this axis is important in that this surface bears against the relieved surface in the pivot housing.

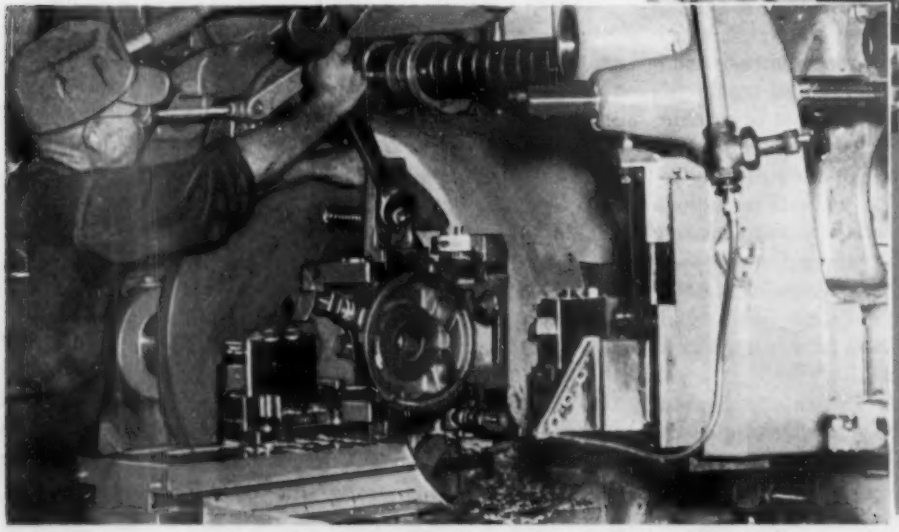
Assembly is performed on a roller conveyer which carries the gun mount foundation. Parts feed from the machine shop on roller conveyers which enter the assembly room at regular stations on lines perpendicular to the assembly line. Two stations on each feeder line precede arrival at the final line. These stations consist of a tank for washing the part thoroughly, and a bench for performing minor sub-assemblies.

REBUILDING MACHINES FOR CARBIDES

One interesting jig noted in the tool room will be used in drilling holes in the bottom of the pivot—on a multiple spindle setup. Work is rolled into the jig on rollers which are part of the jig base. A quick-acting pneumatic clamp thrusts the part against a V-block, in proper alignment beneath the drill jig plate.

Operations on the heavy gun mount were set up in 1941. The machine shop was a dead plant which Norge purchased and will use after the war. Machines were used equipment, some dating back to 1900, purchased from a plant in Illinois. So that carbides could be used wherever applicable, it was necessary to tear down the heads on the machines, install V-belt pulleys and gear changers. Cuts as heavy as 3/8" deep, developing as much as 700 pounds of pressure at the tool point (300 sfpm) necessitated this overhauling.





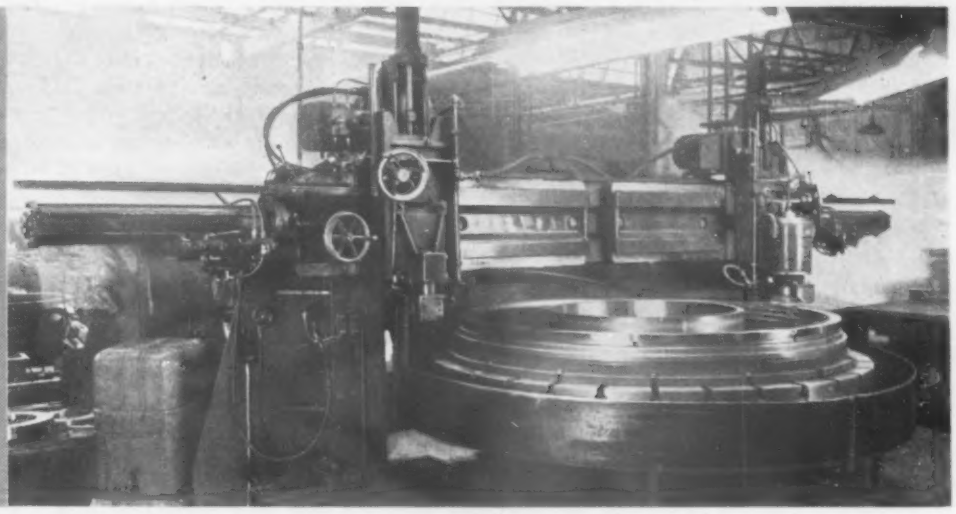
Turning pivot housing for a heavier gun mount at Norge machine shop. Newer and lighter mount calls for similar operation on a smaller cylinder.

Norge photos

Use of "target" fixture permits rapid loading of light gun carriage in an automatic lathe at Norge machine shop.

Ingenious Machines Slash Man-Hours

Kaydon Engineering designs and builds machines to eliminate hand scraping on gun mount bearing surfaces, saving more than 90% of manpower required for job



Special machine developed by Kaydon Engineering to eliminate handscraping. Based on boring mill design chief features are compound cross rail and precision bearings in table and base. Machine shown, grinding bearing paths for heavy Navy gun mounts, has 100" table. Same design is adapted to finishing gun mounts.

Kaydon photos

A TOP PRODUCTION ENGINEERING JOB can be credited to Kaydon Engineering. One of Muskegon's smaller and newer plants, it is also one of the smartest. Starting from scratch, this company undertook manufacture of thrust and radial bearing paths for the Navy's heavy 5" Pedestal and Base Mounts and also the Bofors Twin and Quad Mount. Like many other companies, Kaydon had to provide its own machinery, train operators to run it. But it went a good long step farther than many in designing heavy equipment for precision production which effected tremendous savings in skill requirement and man-hours. Nor did it stop with its own problems. One of the biggest savings from Kaydon's efforts had an advantageous result from the prime contractor on the gun mount.

MACHINE IMPROVES BLUING CONTACT

Six machines were designed and built to eliminate hand scraping on the 10 surfaces where the bearing paths seated in the mount, as well as on several large rectangular surfaces. Where 70 per cent contact is considered good for hand scraping, the machine produces an even greater percentage of contact on a bluing test. And where 200 man-hours may be invested on a hand scraping job, the new machine completes the operation in 10 to 12 hours. On the gun mount, six surfaces involving diameter as large as 65" are ground to a relationship within limits as low as .0002".

With some major exceptions, the Kaydon surface finishing equipment is based on large boring mill design. One exception being in the provision of a compound cross-rail mounted on the bridge permitting independent adjustment of each cross-rail segment to maintain accuracy. Accuracy is also obtained through provision of extreme rigidity and precision bearings in the table and base.

Another feature to eliminate vibration and chatter is the unique design and construction of the superstructure which carries the two vertical grinding heads.

Another feature to eliminate vibration and chatter is the unique design and construction of the superstructure which carries the two vertical grinding heads.

This superstructure is not an integral part of the main spindle housing, but is a unit anchored independently and in alignment by the machine foundation with means of positive insulation to prevent sympathetic vibration between elements.

The superstructure consists of two upright columns of a deep double "H" substantially ribbed and with a wide spread triangular rib brace flaring out from top of upright columns both sideward and rearward.These ribs with the upright columns are securely mounted on a fabricated structural steel base and anchored in the deep concrete foundation.

Nearly identical to the design of the machine built for finishing the gun mount is the equipment used in the Kaydon plant for finishing large bearing rings. Only difference is the low bridge clearance, which in this case is 21" above the 100" table. The accuracy obtainable in the compound cross-rail is essential to finish grinding the 90" rings. A finish specification of four to six microinches can be met if required. Heads mounted on each rail are raised and lowered hydraulically on vertical slides. As set up for complete machining of rough machined forged rings, boring and facing operations are performed on the one head, finish grinding is performed on the other head. Both heads are traversed to rough adjustment by hydraulic actuation, and are finely adjusted manually.

VARIABLE SPEED ON TABLE DRIVE

The table is powered by a 7-½ hp motor, connected to a variable speed drive capable of delivering between 3 and 15 rpm, in stepless increments. The table is mounted on a heavy semi-steel cast spindle which is accurately ground and carried by preloaded roller bearings in the main spindle housing, inherent aligning being maintained by the wide spread of the anti-friction roller bearings.

The top, or load carrying bearing is an oversize super

precision double row tapered roller bearing, while the lower or aligning bearing is an oversize super precision double row preloaded straight roller bearing.

Work is mounted on a magnetic chuck, in the form of a ring bearing on the work throughout.

Kaydon is using, at present, 17 of these special design machines, with table sizes ranging from 60″ to 100″. In an effort to speed delivery, no design time was expended for appearance. The top of the two upright columns are rigidly tied together by a fabricated triple channel section and heavy plate cross tie, this member also serving as the mounting for the two compounds which are positioned one on each side of the center of the cross tie.

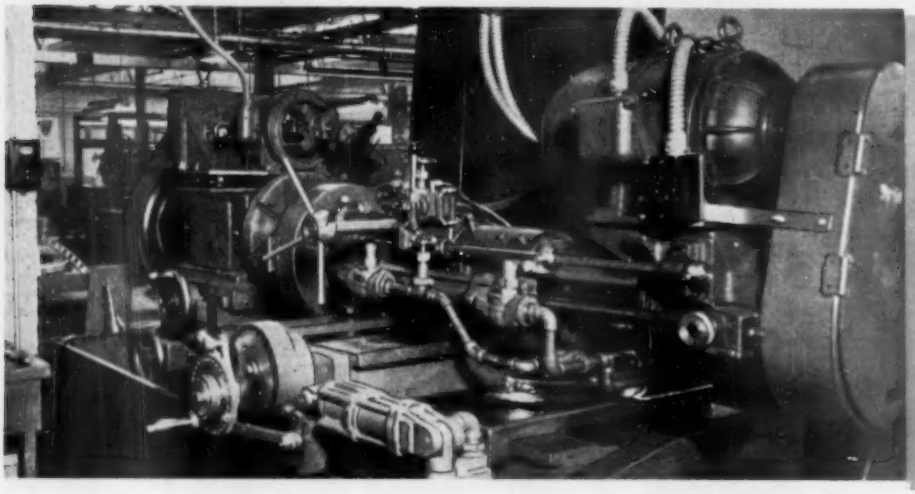
Work is gaged on the machines by means of a master ring mounted in the center of the table. In machining the 90″ ring, a span of 18″ only need be measured in gaging the I. D. In this connection, accuracy of cross-rail adjustments is gaged by the production result on the work.

Another machine which Kaydon has designed to meet its war production requirement is a grinder equipped with an oscillating head, powered by electronic variable speed drive. A reciprocating spindle action is also available for working on cylindrical surfaces. Spindle speeds are adjustable through a stepped v-belt drive. The spindle mounting includes a swivel to permit setting the spindle at any desired angle. The machine, as operated, produces parts within limits of .0002″ on the diameter.

In addition to streamlining production requirements in the manufacture of gun mount components, Kaydon has saved materials and man-hours in redesign of bearing separators and roller bearing gages. Cast bronze separators were replaced with a stamped product, with materials savings ranging from 65 to 72 per cent. Additional savings were effected in fabrication, storage and installation.

Development of a laminated plastic bearing cage—the first of this type to be used for roller thrust bearings—saved bronze and reduced weight.

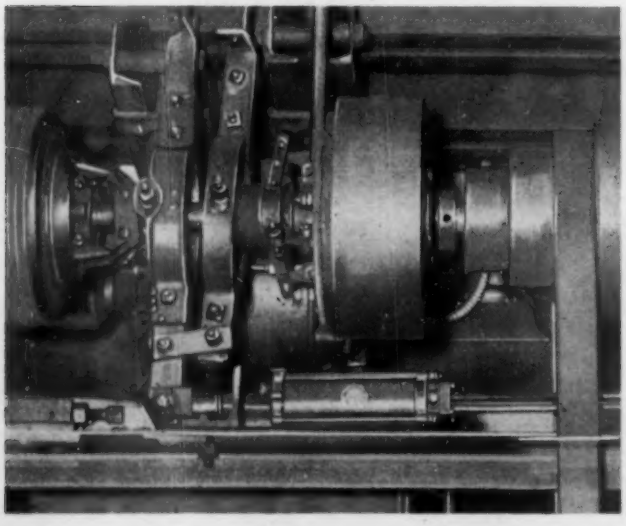
Details of these applications will be released in next month's issue of THE TOOL ENGINEER.



Grinding machine equipped with oscillating head, powered by electronic variable speed drive, as developed by Kaydon Engineering. Reciprocating spindle action is also available for working on cylindrical surfaces. Spindle mounting includes swivel for setting at any angle.

Tooling to Increase Machine Capacity

Sealed Power applies semi-automatic machines to boost output of pistons, rings and sleeves. Increase in women operators demands attention to fatigue factor



THE EXPERIENCE of the Sealed Power Corporation in boosting output in the face of a critical manpower shortage was in their own word one of "streamlining production." Increase in manufacture of piston rings for aircraft engines, and truck engines, plus continued production of rings for such items as compressors, was matched by boosts in output of sleeves and pistons. Flexibility had to be maintained to meet variable schedules on piston sizes, ranging from 1-⅜″ to 8″. With the necessity of putting unskilled labor including women, to work came the requirement for providing general utility operators and setup men in each department who could keep machines and operators busy supplying these important items.

Piston production called for increased machining capacity, as well as for simplification of several operations.

Pneumatic booster application in Sealed Power plant relieves women operators from handling overhead shifter.

Sealed Power Corporation rebuilt automatic drilling equipment for milling relief around piston pin bosses. Converted equipment produces at rate of 35 pieces per hour, compared to 25 pieces guaranteed for special equipment designed especially for the job.

Sealed Power photos

In one instance, where a machine of special design could not be provided for milling relief around piston pin bosses, an automatic drilling machine was rebuilt to do the job. The converted equipment produces at a rate of 35 pieces per hour, compared to the 25 pieces guaranteed by the special design.

Centering the part on a rotary fixture, slow table rotation is employed to provide radial work travel against a side cutting spiral milling cutter. A similar setup is used in profiling pockets inside the piston for weight reduction. Individual adaptors which locate the work accurately are readily setup for three sizes of pistons. Advantages of the machine as designed for this job is rigidity of spindles, and table design for accurate machining and simple, rapid clamping and adjustment. Tables are raised, following clamping of the work, to proper level with the spindle by compressed air.

SEMI-AUTOMATIC DRILLING AND REAMING

A semi-automatic machine and fixture combination permits high production output on "rough" boring pin holes in pistons. Three drilling and reaming operations performed by tools mounted on opposed spindles are followed by reaming through both holes by a single tool to an alignment of .002". Work is loaded in an indexing fixture which revolves through a vertical plane between the horizontal spindles. The pistons locate against V-blocks which fit snugly under spring pressure against piston bosses. Bolt clamps bring the parts up securely against the spring-locating V-blocks.

Finish boring of the pin holes is performed in automatic machines which produce holes aligned within, .00025" limits.

In manufacturing pistons to a weight specification, an internal flange is cast into the part. As a final operation, this ring or flange is machined away until required weight remains in the part. Method for performing this operation includes weighing the part previous to precision boring of the internal flange. The overweight is noted in terms of ounces. The boring setup includes catching the chips from the operation in a hopper mounted on a second scale. The accumulation of chips equal in weight to the overweight indicates that the part is produced to weight specifications.

Compressed air has been used in several instances to reduce fatigue, in fact to make it possible for women to operate machines which have not been generally assigned to them. One such instance is the provision of pneumatic actuation on the chucking lever on a lathe, and another is a pneumatic booster to actuate the clutch on overhead transmission pulleys. Pneumatic feeds on drilling operations have also proved satisfactory.

Economical Clamping and Holding Fixtures

Bennett Pump division reduces manual operations and adjusts job sequence on ordnance production to increase output without adding to pre-war employment

FROM THE PRODUCTION of a line of service station equipment of which the principal items were Bennett gasoline pumps, oil, grease and kerosene dispensing units and Eco tire inflators and compressors, Bennett Pumps Division of John Wood Manufacturing Company, Inc., converted to ordnance manufacture, requiring complete conversion of plant layout, manpower experience, and equipment adaptation. Machine space was doubled, old assembly areas disappearing. New high production machines, such as automatic milling machines, turret lathes, and a pull broach were installed. Conveyers used in paint and assembly lines were adapted to handling materials flow from the production setup.

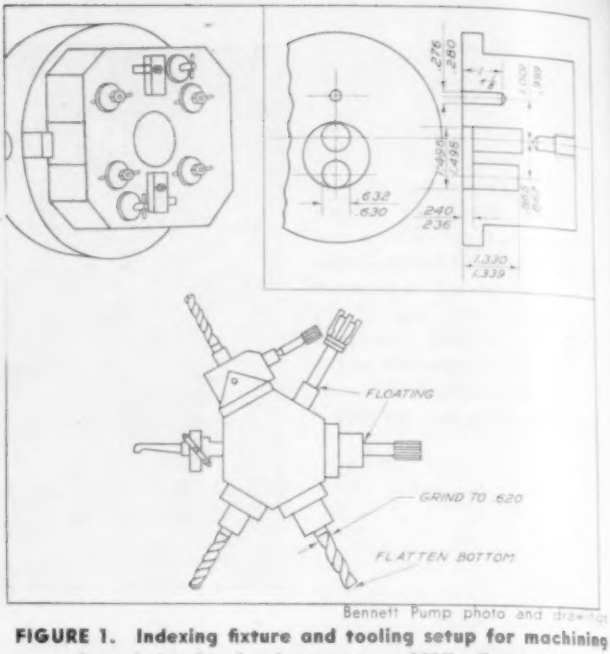
One of the first Muskegon companies to convert to war production, Bennett Pump undertook production of gun loading mechanisms for the Browning 30 mm., supplying small hand-operated devices which inserted cartridges in cotton belting. Today, this company is the only manufac-

turer of this equipment. In addition to this job, the company is also producing parts for the 105 and 155 mm. cannon.

From a straight metal-cutting standpoint, it is interesting to note that a major share of this plant's peacetime operation was concerned with machining cast iron. The wartime job has required determining feeds and speeds, cutting tool designs, and clamping devices for machining steel forgings, ranging from SAE 1020, through the free machining series, to tough stringy 4140.

HOW LABOR REQUIREMENT WAS HELD DOWN

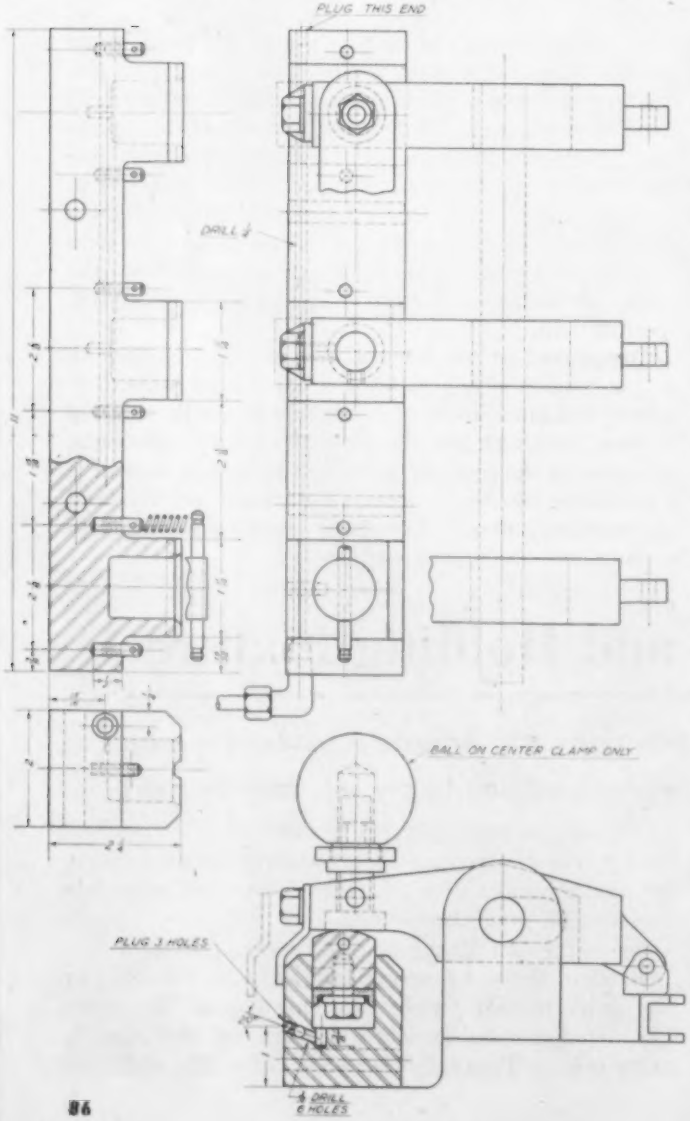
However, the bigger and more complex problem concerned tooling for higher production in the face of a manpower shortage. The success of this tooling is indicated by the payroll. Employment has hardly increased over peak hiring in pre-war years. In addition to adapting tooling, production control, and production planning to overcome the manpower problem, it was necessary to develop methods to counter the unavailability of machines designed for the job at hand. Result has been an ingenious application of fixtures, jigs and clamping devices which reduce manpower requirements and adapt machines to the requirements of the job.



Bennett Pump photo and drawing

FIGURE 1. Indexing fixture and tooling setup for machining three holes in circular part to .001" alignment.

FIGURE 2a. Clamp for broaching fixture is positioned by hand before hydraulic jacks supply 700 pounds pressure.



One of the most interesting clamping devices in the plant has been directly responsible for a production increase of 150 parts a day, relieving need for an extra shift operation as well as supplementary work on milling machines. The job consists of broaching an undercut slide in the cartridge guide of the belt-loading mechanism. A horizontal pull broach makes four passes through the free-machining steel forging. The fixture originally designed to hold the part securely required several hand motions in clamping, was inaccessible to the operator, and induced fatigue. Combined pneumatic-hydraulic and mechanical action have been employed to simplify this operation.

As machined, the part lays on its side, the cutting teeth of the broach facing the operator. It is necessary not only to hold the part down, by clamping action from above, but also to hold the bottom of the part firmly against the vertical side of a broaching fixture which parallels the travel of the broach. To accomplish the latter, it is necessary to pull the part back against the fixture.

MECHANICAL AND HYDRAULIC CLAMPS

Mechanical action is satisfactory for this job. Though the sides and bottom are supposed to be square, enough variation occurs in forging dimensions and preliminary machining to require equalizing action in the exertion of the clamping force. The part lays across two drawbars, its sides resting against two uprights at the end of each bar. The bars extend from ends of a rocker arm which pivots in the center to equalize pressure, should the drawbar uprights fail to contact the sides of the work simultaneously. The rocker arm in turn is pulled back by a rod, actuated by turning a cam against the inside of a flange on the rod.

Downward force on the work is exerted by a second and independent set of three rocker arms which are moved by small hydraulic jacks. Because pressure on the three jacks is equal, the extremes of the rocker arms may contact the work independently, but with the same force. The jacks are actuated by a hydraulic line carrying 700 pounds pressure. This line, however, derives its force from nothing more than the 85 pounds carried in the factory air line.

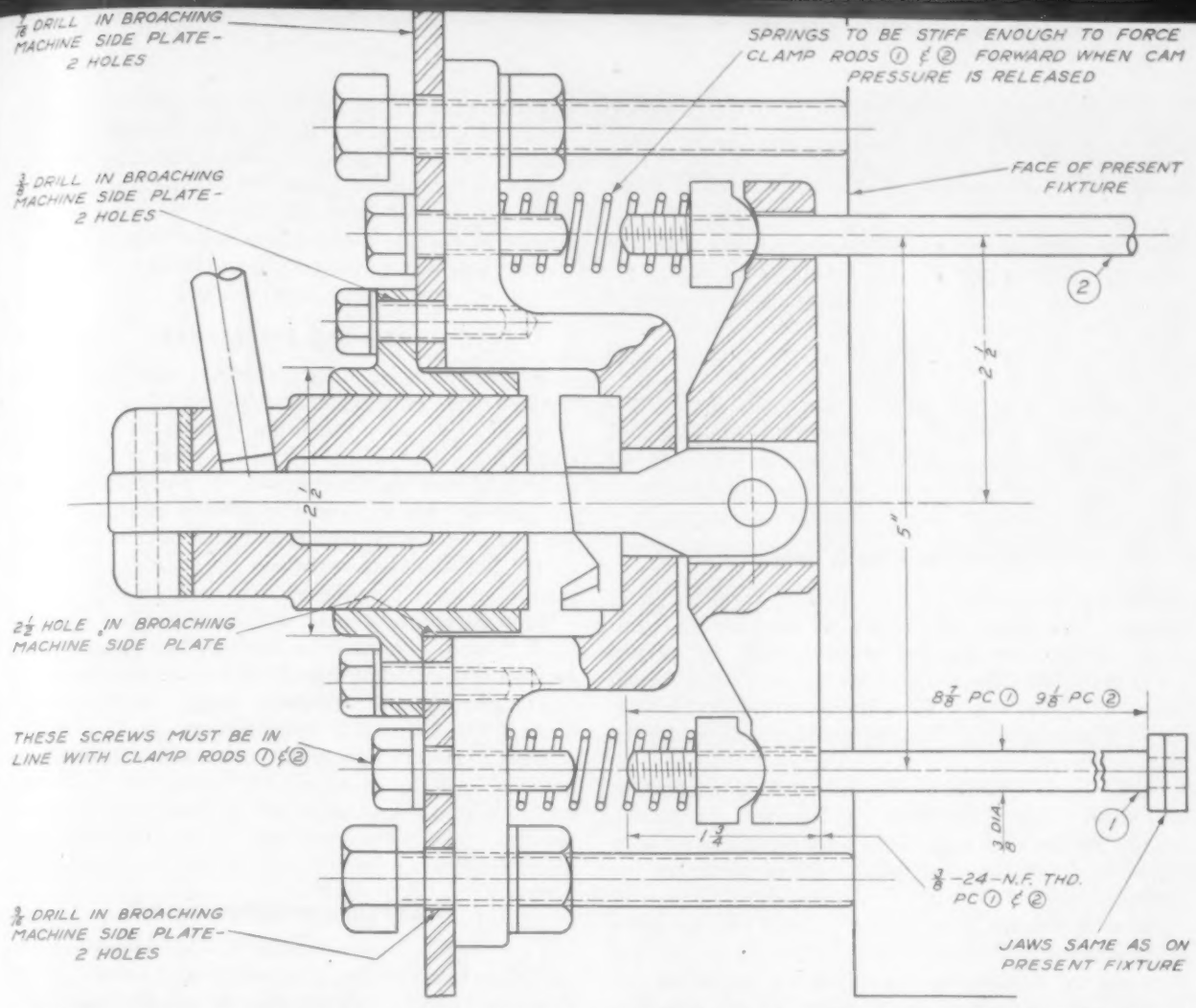
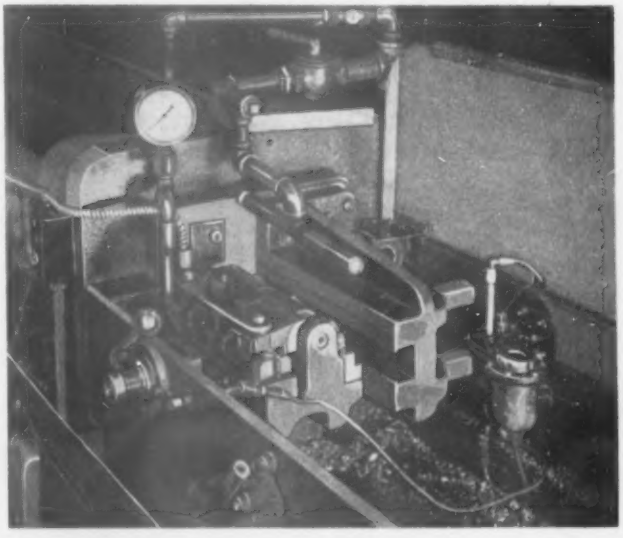

7/16 DRILL IN BROACHING MACHINE SIDE PLATE - 2 HOLES
SPRINGS TO BE STIFF ENOUGH TO FORCE CLAMP RODS ① & ② FORWARD WHEN CAM PRESSURE IS RELEASED
3/8 DRILL IN BROACHING MACHINE SIDE PLATE - 2 HOLES
FACE OF PRESENT FIXTURE
2
2 1/2
2 1/2
5"
2 1/2 HOLE IN BROACHING MACHINE SIDE PLATE
8 7/8 PC ① 9 1/8 PC ②
THESE SCREWS MUST BE IN LINE WITH CLAMP RODS ① & ②
1
3/8 DIA.
1 3/4
3/8 -24-N.F. THD. PC ① & ②
7/16 DRILL IN BROACHING MACHINE SIDE PLATE - 2 HOLES
JAWS SAME AS ON PRESENT FIXTURE

FIGURE 2b. Hand-operated clamp on broaching fixture used to hold part firmly against vertical side of fixture. Note equalizing action through rocker arm.

Factory air pressure of 85 pounds is converted to 700 pounds hydraulic pressure to actuate clamping mechanism on broaching fixture, at Bennett Pump plant.



the difference being built up in the ratio of the pistons and cylinders of the two systems.

Only manual action required in operating the hydraulic clamp is that of turning on the air pressure with a lever, and of setting the rocker arms over the work with a single lever motion which permits sliding the whole loosely linked assembly through a slot and pin arrangement to the proper position. This is required because the clamping assembly must be drawn back for loading and unloading work. The entire clamping operation is performed with three easy hand motions, two of which are handled almost simultaneously. The mechanical action clamp is actuated first by lever, then the hydraulic clamp is positioned by a second lever action, followed almost immediately by application of air pressure.

LIMIT SWITCH REDUCES SPOILAGE

A second attachment to the machine prevents reversing the travel of the broaching tool when the work is still loaded. It was found that on this highly routine operation, the least distraction of the machine operator might cause him to neglect removing the work, though he was likely to pull the reverse lever, thus returning the tool through the work. This not only damaged the work, but threatened to break a broach.

As set up now, the placement of work in the fixture actuates a limit switch which brings a solenoid into action, causing a metal stop to project from the machine frame blocking the course of the machine reverse lever.

One other interesting phase of this job was the respecifi-

cation of material. SAE 1020 proved so soft that the broach tended to tear the work. On the other hand, 1045 proved a little too hard. A free machining steel was substituted with satisfaction. This of course was permitted because no particular physical strains are imposed on the part in action.

Broaching operations consist of fairly equal distribution of cutting load in removing metal from the forged groove for the first three cuts, with the fourth cut providing a finish on the bottom and sides and under-cutting and angle formed between the walls and bottom of the third cut.

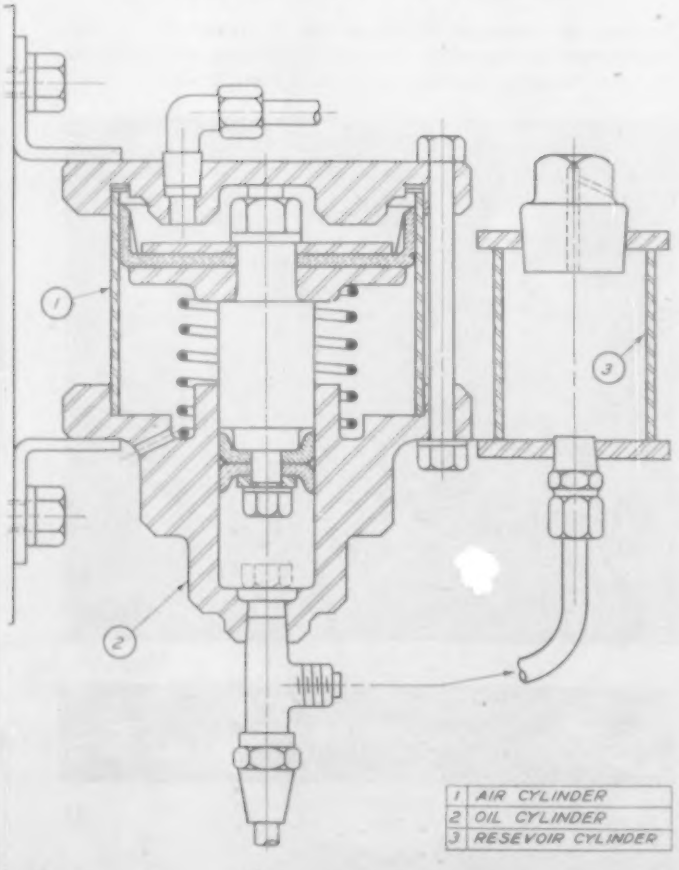
BORING ON A DRILL PRESS

Through fixture design, production engineers have adapted single spindle drill presses to rough boring operations. Boring bars chucked in the spindle are piloted above the cut by a conventional bearing, and below the cut by revolving bearings. Parts are located before clamping by a plug segment, with the assistance of a relieved locating pin.

Such jobs are finished on automatic boring machines to fine finish. These machines, typical high production models, are also used to perform some typical turret lathe boring jobs, relieving that department of bottleneck operations.

Indexing fixtures have proved useful in balancing heavy cuts on SAE 4140 forgings. Straddle milling had been selected to finish two ears on a heavy part in one cut, but it was found that the four cutters involved were not maintaining alignment. By the use of indexing fixtures, which presented the part for a single straddle milling operation on each ear, indexing 180° for the cut on the opposite ear, accuracy was maintained. Fixtures index for position location. Parts are located and aligned by screwing onto a plug, employing a Class 3 thread previously machined to product design requirements.

FIGURE 2c. Air-operated plunger (85 pounds) develops 700 pounds hydraulic pressure to actuate clamp.



ALIGNING THREE HOLES

Where three holes in a circular part must be aligned in the face of the part to plus or minus .001", it was found practical to design an indexing fixture to be mounted on the head stock of a turret lathe. One of the holes is concentric with the centerline of the part, but others on each side of it are not, and it is therefore necessary to shift the part from center, requiring the use of counter-weights to balance the fixture which must be turned quite rapidly for machining the relatively small holes.

The part indexes simply, a worm sliding the clamping block through a groove in an auxiliary face plate. Positive location is obtained by use of index pins, one serving for two locations, and the second serving for the fourth. Two nuts must be loosened to index the part.

Any cumbersomeness in the fixture is warranted by the remarkable reduction in scrap to practically zero. The part is located from a previously ground O. D. related to the center hole. Only one setup is required, in place of three, assuring accuracy.

BALANCING MACHINE OUTPUT

Their approach to individual jobs and to sequences of operations is largely concerned with maintaining a balance of output and of providing greatest possible economy in machine time and manhours. Machine clusters, where one operator tends several units, including more than one type of machine on occasion, were one general method of solving the manpower problem. In other cases, the order of production or the breakdown of a job has been altered to permit the employment of women.

In one instance, scheduled output required the use of two turret lathes on the same job, followed by a conventional burring operation. A man had operated each machine and performed the burring at a nearby bench on the output of his machine, resulting in same "down time" for each machine. Today, one man is busy operating both machines at full capacity and a woman performs burring operations. Revising the setup has not only relieved a man for heavier employment than a woman could perform, but has permitted an economy of operation, so that an 80 per cent production increase has resulted.

TOOLING EXPENDITURE

In certain cases, tooling has been more expensive than might be warranted in peace time production, either because of the inadequacy of the machine, or because it was necessary to ease or simplify the operation for women or unskilled workers.

A battery of light automatic milling machines, producing contours on small parts through combined use of forming cutters and cam control of work travel, have been tooled insofar as clamping action is concerned, for complete operation by women.

THE END

USES OF TOOL STEEL TUBING

Man-hours, machine time and materials may be saved by substituting tubing for bar stock where rings or rolls are required in machine and tool engineering. Typically ingenious tooling applications are described here

GEORGE BISSETT
PRESIDENT
THE BISSETT STEEL COMPANY

Bissett photos

FIGURE 1. Using steel tubing instead of bar stock permits substituting simple sawing operation for tedious boring.

ALTHOUGH tool steel tubing has been in use for approximately 20 years, it is probable that many of its applications still remain to be discovered. When introduced to American industry by the Bissett Steel Company in 1925, it was put to such simple uses as the manufacture of blanking and forming rings for metal stamping dies, where it eliminated the labor and cost of boring bar stock or forging rings.

Today, tool makers are applying it to a broad range of tools which involve a ring or tubular part of any kind. In checking on the various uses of tool steel tubing, it is seldom that exactly the same application is discovered in two different plants (with the exception, of course, of die shops, where its use is simple and relatively limited in scope). This is shown by the accompanying illustrations, which show tools ranging from a slim slitter blade (Figure 9) made from a thin ring of tubing, to massive crushing rolls (Figure 2).

Tool steel tubing is made by piercing or extruding a type of oil-hardening, non-shrinking tool steel which has proved superior to many tool and die steels for work requiring great hardness and abrasion resistance. When it is properly heat treated, it is receptive to unusual hardness penetration. It is not difficult to harden, because it may be heat treated with in an extremely wide range of temperatures without distortion or harmful strain, and because it is virtually insensitive to rough treatment during the hardening process.

It is produced in sizes from 1″ to 14″ OD, with a wide range of wall thickness. To obtain a tube or ring for a given use, it is only necessary to select a piece of stock with the OD and ID closest to the specified sizes or the part to be made, and saw off a section. Some machining will naturally still be necessary, but the major operation of boring a large hole through a piece of solid bar stock is eliminated. This is illustrated by Figure 1, which shows a section of 8″ OD—4″ ID tubing being cut off.

The principal advantages of tool steel tubing are that it saves time and reduces cost. The manner in which it saves time is obvious, but the cost reduction involved has a number of ramifications. For instance, the price per pound of tool steel tubing is slightly higher than the price of a comparable grade of tool steel bar stock, but a given length of tool steel tubing frequently costs less than a bar of the same length and diameter because of the weight saved by the hole in the tube.

FIGURE 2.
Tool steel tubing meets rigid physical specifications when used as crushing roll in machine which pulverizes ceramic materials. End discs welded to roll support shaft. Monel metal electrodes recommended for fabrication.

Boring a 4″ hole through a bar of tool steel 12′ long and 6″ in diameter is equivalent to converting a 12′ by 4″ bar (or about 516 pounds of steel) into a pile of worthless scrap. The use of tubing in this case would result in a substantial cost saving in steel alone, as well as a saving in freight.

In addition, tool steel tubing saves the cost of the labor involved in the boring operation, as well as the cost of tool bits, machine maintenance, and power, to say nothing of the diversion of manpower which might well be used for more profitable work.

There are three general groups of parts for which tool steel tubing seems to be best suited, although others may be developed. They are:

(1) cutting, blanking and forming tools

(2) sleeves, bushings, collets, reciprocating parts

(3) machine parts, such as bearings and rolls.

Before studying typical tooling applications which may be classified in the first two groups, brief consideration of the third group may be helpful in establishing physical characteristics. Figures 2 and 3 show typical,

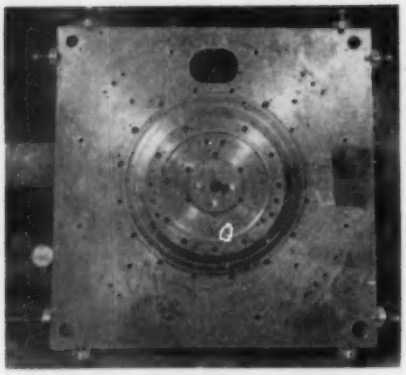


FIGURE 3. Drill jig used with radial drill is 44″ square, has a total of 52 holes. Each hole has a liner bushing which has been cut from tool steel tubing. Importance of application at this time is that standard bushings have not been available.

though differing, applications of tool steel tubing in the manufacture of hardened rolls.

Figure 2 shows crushing rolls for a machine which pulverizes ceramic materials. These rolls are subjected to the severe punishment of extremely hard and abrasive materials. Made from sections of tool steel tubing 11″ OD and 6″ ID, with discs to ordinary steel welded into the ends of support a 2-⅜″ shaft, they have given better service than any other type of roll.

Ordinarily, chill-cast rolls were used for this job. The surface hardening of the castings was adequate, but the abrasive action of the materials crushed wore off the surface very rapidly, and the tools had to be not only ground but heat treated several times in the course of their life.

The tool steel rolls are hard throughout, and will undergo any number of grindings without lessening their effective hardness. The machine manufacturer has also tried ordinary tubing with a carburized surface, but the hardened surface wore off in that case also. In the end, the tool steel rolls have proved far less expensive and more satisfactory.

It is interesting to note that the end discs which hold the shaft are welded into place with monel metal electrodes, because ordinary welding rods might pick up too much carbon from the tool steel and the welds would then tend to crack. Incidentally, it has been found that hard chrome plating the tool steel rolls to a depth of .005″ has increased their life considerably.

On a cold rolling mill for flattening steel strip, the entry roll, over which the strip passes under slight tension as it leaves the reel is made of tool steel tubing. The wear and tear involved here is not nearly so severe as that inflicted upon the crushing rolls, but the roll must be hard enough to resist any scratching or scraping attack of the strip, for if the roll were scored or nicked it would leave a continuous scratch upon the strip from that point on.

In making this roll, the machine builder takes a light cut on the tubing's outside circumference to remove scale, and counterbores and finishes the ends to receive anti-friction bearings. The job is done. No cut is necessary on the inside of the tube because the shaft fits the ID of the bearings. The main reason for using tool steel tubing in this case is that it saves 60 per cent (or more) of both machining time and cost. It is hardened to 85 scleroscope, or approximately 60 Rockwell C.

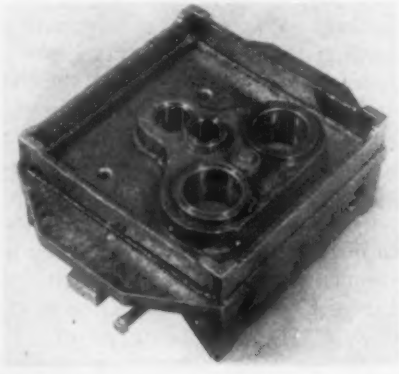


FIGURE 4. Jig used for boring a 3-step hole. Larger holes are bushed with tool steel tubing.

One of the commonest uses of tool steel tubing is in the manufacture of special bushings, where a very hard, tough ring of steel is required. An exceptional instance of this is illustrated in Figure 3, which shows a huge drill jig, used for locating holes to be produced by a radial drill in a cast steel part of a power shovel.

This jig is 44″ square and has a total of 52 holes which are used for drilling. Each of these has a liner bushing which has been cut from tool steel tubing. This material has been particularly valuable in this case, because standard bushings have not been available, and the time and cost involved in boring solid bars for the job have been prohibitive.

This is a recent application and no estimate has yet been made on the percentage of tooling time saved, but it is known that the increased speed of either making or rebushing such jigs is the principal factor involved in the purchase of tubing for the job.

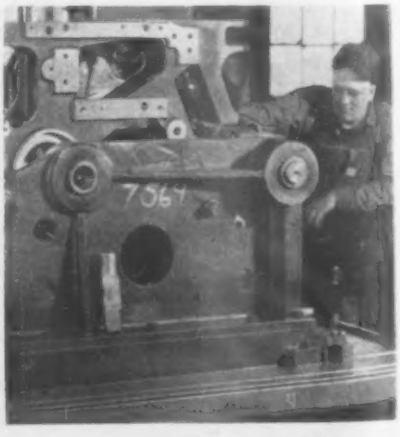
A much smaller jig, used for boring a three-step hole in an industrial truck wheel, is shown in Figure 4. The two larger holes are the ones bushed with tool steel tubing. One guides the tool for the left-hand wheel, and the other for the right-hand wheel. These bushings were previously bored from a solid bar of tool steel, but now they are made from a 4″ tube with a 2-¾″ ID, which is machined only ⅛″, saving by far the greater part of the labor involved in making the bushing. Only a finishing cut is required for the OD of the tubing.

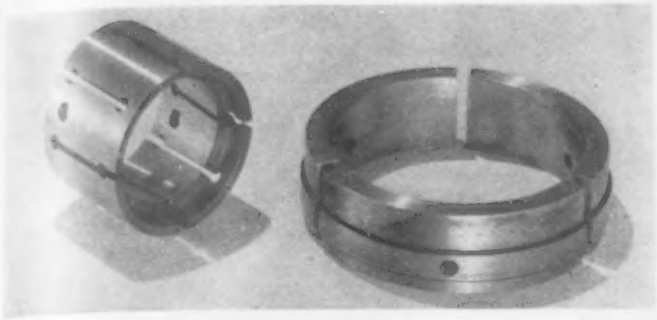
Figure 5 shows a tool steel tubing liner bushing in actual use. In the foreground is the jig, for boring two 9″ holes in a power shovel turntable bed, with one bushing inserted at the upper right-hand corner and another at the upper left. The one at the right, nearest the operator, is supporting the boring fixture of a Giddings & Lewis table-type horizontal boring mill.

This job demands great wearability and abrasion resistance because of the heavy load carried and the presence of dirt and chips at the point of contact between the boring fixture and the bushing. The bushing is 4½″ long, with a 3″ ID, 4″ wall thickness, and a ⅝″ shoulder to prevent it from sliding in the jig.

Tool steel tubing for bushings within a machine tool itself is applied on a Giddings & Lewis table-type mill-

FIGURE 5. Tool steel liner bushing used in jig for boring two 9″ holes in power shovel turntable bed. Bushing at right supports boring bar.





Above: FIGURE 6. **Expansion sleeve at left is slotted to provide 1/32" symmetrical expansion. Part at right is 3-piece collet bushing, made by cutting a ring off a tool steel tube and machining the shoulder or ridge on the circumference.**

Right: FIGURE 7. **Expanding arbor, with assembled work-holding tool shown at left. Parts are made from tubing, and consist of slotted sleeve and straight and tapered rings which fit on shaft.**

ing machine headstock. The main spindle sleeve bushings are sections of tool steel tubing, first inserted and then ground on their ID in order to provide and maintain an extremely close fit.

This job previously was done with bronze bushings, and tool steel tubing was substituted to eliminate excessive wear. It has proved highly successful practically eliminating galling and scoring. Little change of design was required in the replacement, the only changes being toward simplification. Using tubing permitted specification of straight bushings, eliminating a take-up device necessitated by the tapered bronze bushings.

No difficulties have been experienced with the tool steel tubing bushings, and call for replacements is exceptional according to the machine tool builder.

Figures 6 and 7 show three different work-holding devices which are made of tool steel tubing. In Figure 6 the part at the left is an expansion sleeve, slotted to provide flexibility in the walls and tapered inside to fit a tapered arbor. This sleeve will expand symmetrically as much as 1-32".

FIGURE 9. Slitter blade made from a thin slice of tubing, with cutting edge machined to proper angle.

The part at the right is a three-piece collet bushing. It is made by cutting a ring off a tool steel tube of the proper size, machining the shoulder or ridge which may be seen on the circumference of the bushing, sawing almost through the ring at three equidistant points, heat treating the whole ring, and then completing the cuts with an abrasive wheel. This manner of separating the three pieces is necessary to prevent the distortion which might occur if the three pieces were hardened after severing.

The expanding arbor shown in Figure 7 is an excellent example of the use of tool steel tubing in work holding tools. The arbor is shown assembled at the left of the picture, and "exploded" at the right. The parts which are made of tool steel tubing are the slotted sleeve shown in the center, and three rings, one straight and two tapered, shown on the shaft and beside it.

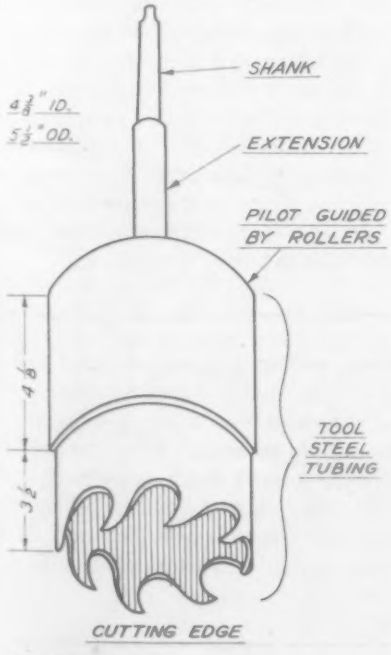
This arbor is used to hold a cylindrical part, whose walls are too thin to permit outside clamping, while it is being turned on a lathe. The only surfaces touching the ID of the work piece are the ground ends. The section between has been turned dark by the heat treating operation. The sleeve is 13-⅛" long, 6-⅞" OD, and 4" ID. It has six slots, three at either end. These slots are made with a milling machine, starting from a ¼" hole bored in the wall. A narrow tie bar is left at the edge of the sleeve until the part had been heat treated, whereupon it is cut through with a rubber abrasive wheel.

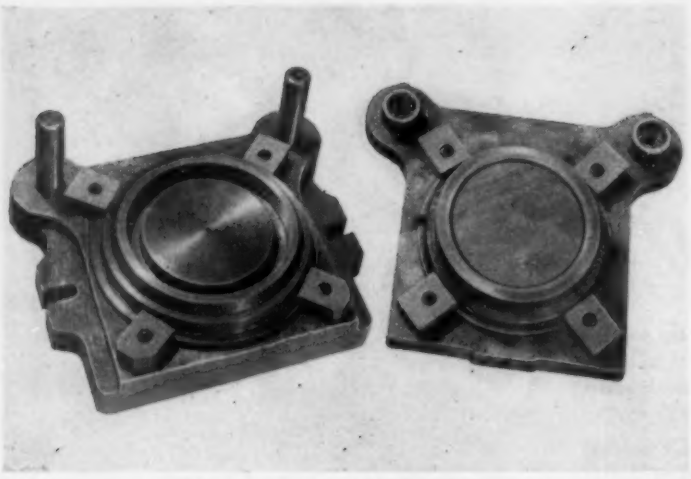
In its present application, the arbor expands .010" to hold the work, although it is capable of .050" expansion if necessary. Expansion is achieved by drawing up on the nut and forcing the tapered parts toward the center of the arbor. The tapered parts are made simply by grinding a 13° taper on a ring of tubing to correspond with the internal taper of the sleeve.

This tool was previously made of a solid bar of carbon steel bored out, machined and carburized. However, this material warped in hardening and sprung out of shape in use. Tool steel parts also wear much better.

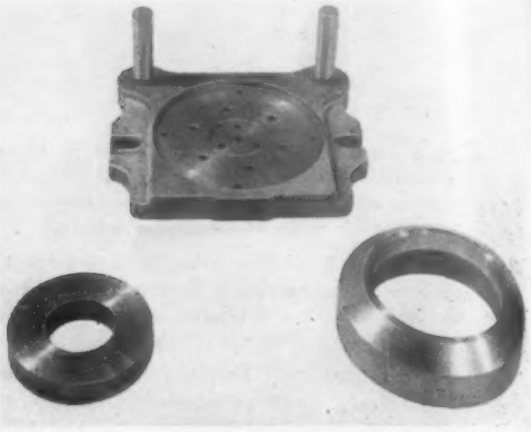
Figure 8 shows a cutter head and guide made from a single piece of

FIGURE 8.
Cutter head and guide made from a single piece of tool steel tubing.





Left: FIGURE 11.
Assembled die. Mounted on shoe at left is heavy ring of tool steel tubing. Bottom step provides clamping surface, middle step reduces weight and surface to be ground in sharpening, and upper step is cutting edge. Draw ring and punch are also made of tubing.



Above: FIGURE 10.
Die, ready to receive blanking ring and draw ring, both made from tool steel tubing.

Left: FIGURE 12.
Flexible universal die set. Only two shoes, one for die and one for punch, are required. Tubing rings of varying ID but same OD are clamped into die shoe, and rings of varying OD but same ID are clamped into punch shoe.

tool steel tubing. This tool is 5-½" OD by 4-⅜" ID at its thickest part. It was previously made by setting high speed inserts into a piece of ordinary steel tubing. It has not been in use long enough for all of the advantages of the new method to become apparent.

Figure 9 shows another type of cutting tool, a slitter blade made of a thin slice of tubing with the cutting edge machined to the proper angle. Such a blade may be used for cutting metal or other materials, and may be used on an arbor with several other such blades, separated by tool steel tubing spacers.

Figures 10, 11 and 12 show various uses of tool steel tubing in the construction of metal stamping and forming dies. Figure 10 shows a die in process on construction, with the die ready to receive the blanking ring (right) and the draw ring (left), both of which have been made with a minimum of machining from different sized tubes of tool steel. The punch (not shown here) is made of still another size.

Figure 11 shows a similar die, assembled. Mounted on the shoe at the left of the picture is a heavy ring of tool steel tubing. Concerning the three steps machined into it, the bottom one provides clamping surface, the middle one simply subtracts metal and reduces the surface which must be ground to sharpen the die, and the top one is, of course, the cutting edge of the die. The draw ring and punch also are made of tubing.

A very flexible universal die set is shown in Figure 12. Only two shoes, one for the die and one for the punch, are required. Tool steel tubing rings of varying ID, though with the same OD, are clamped into the die shoe, and rings of varying OD and the same ID are clamped into the punch shoe.

The illustration shows three different dies and three different punches, suitable for mounting on the two shoes pictured. In the plant where these are used, little machining of tool steel tubing is necessary, because standard sizes of tubing fit in with the production schedule. All of the dies shown in Figures 10, 11 and 12 are used in the production of automobile headlight parts from sheet steel.

It is expected that the use of tool steel tubing will spread considerably in the years to come. War production has given impetus to this idea, because of the pressure upon manufacturers to reduce tooling time. In the strongly competitive postwar period, there may be even greater emphasis on time and cost saving of this nature.

• **Cutter breakage on a special plunge milling job** was reduced at General Electric's Erie Works by use of an electric limit-switch in conjunction with a shear pin. A regular shear pin failed because if automatic cycle were not completed, feed would not stop. A limit switch and plunger were installed with a soft brass key. Length and strength of the pin were such that the key would break before the cutter. When the key shears, the projecting end—which rides against a disc connected to the limit switch—falls free, releasing switch and causing machine to react as though cycle were completed.

Convert to Metric? NO!

Production leaders hit back at proposed conversion to metric system.

American system, with decimals, meets needs. Why pay high costs for unnecessary features?

Arthur A. Merry *(left)*, and F. L. Woodcock.
Bramson photo

TO THE QUESTION, "Why buy the metric system on a costly installment plan?" which was posed by A. E. Rylander in last month's issue of THE TOOL ENGINEER, two widely known production authorities have answered that we are only buying the advantageous part of it—the decimal system, and why buy any more.

Readers of Mr. Rylander's article will recall that he based his proposition for conversion to metric on the idea that we are heading toward its adoption anyway, so why not make a complete changeover in the general postwar reconversion of plants and redesign of products. Specific advantages which he listed were that we could more successfully compete in the foreign market, where buyers and other suppliers use the metric system. We would find its use more convenient in conjunction with other fields of measurement, such as monetary and thermal. Supporting his argument, Rylander pointed also to benefits in other industries.

Briefly, F. L. Woodcock, Chief Tool Engineer of Hamilton Standard Propellers and Arthur A. Merry, Chief Tool Engineer of Pratt & Whitney Aircraft — both companies are divisions of United Aircraft Corporation—present their major objections to Rylander's proposal. (The editor assigned to handle this debate —who incidentally makes most of his typesetters' measurements in "picas" and "points"—is satisfied to be merely an innocent bystander.)

Modern American System Has All Advantages

F. L. WOODCOCK
CHIEF TOOL ENGINEER
HAMILTON STANDARD PROPELLERS

THE PERENNIAL QUESTION of whether the metric system of measurement should replace the so-called English or American system does not, in my opinion, merit serious or lengthy discussion because the advantages of continuing the American system so far outweigh the arguments in favor of using the metric system that it seems a waste of time to discuss it. However, there is the danger similar to that surrounding Prohibition whereby to remain silent may appear to give approval.

It is my contention that as far as machine tools, jigs, fixtures and gages are concerned, the American system, with the use of decimals as applied to divisions of the basic inch, has all the advantages set forth for the metric system. As long as manufacturers and workmen continue to use the decimal system as now employed, there appears to be no advantage whatsoever in changing to the metric system.

Until one exceeds dimensions of 10″, the entire American system is based upon decimals—i.e. 1″, multiples thereof, or fractions expressed in tenths, hundredths, thousandths, tenths of thousandths, etc., which is not different from the metric system. For multiples exceeding 10″, it is not the practice of modern engineers engaged in the design and application of tools, gages and machinery to change to feet. That is, any dimensions over 10″ are expressed in inches, such as 11″, 12″, 15″, 20″ and 120″. Except for this minor inconsistency, it is still a decimal system in the full sense of the word.

Candidly, the advocates for the metric system may raise a hullabaloo about this single departure from the true decimal system, but this is the only argument which can be used against the American system, and it is trivial in comparison with all the arguments against changing to the metric system.

Inasmuch as the American system when applied by decimals has every advantage that could possibly be attributed to the metric system, there would seem to be no reason whatsoever for changing over because the cost of changing would be staggering and offer no advantage not already enjoyed. Again, I can admit only to concern, and experience, in the field involving machines, tools, jigs and fixtures. Thus, whether distances may be measured in miles or kilometers frankly does not enlist my interest.

I agree with Rylander 100 percent as far as the difficulties in working with 64 divisions of the inch are concerned. However, the Society of Automotive Engineers has put out a magnificent book on Aircraft Engineering Drawing Room Practice, and the entire thing takes care of the

decimal system so satisfactorily that nothing further need be said. Every argument for the metric system as far as the automotive industry is concerned was handled when the S.A.E. sponsored the decimal system of dividing the inch.

After reading Rylander's article, I am more strongly inclined than ever to the opinion that nothing can be gained by the change, that the expense which would run into hundreds of millions of dollars cannot possibly be justified, and that the confusion and misunderstandings would be staggering. Hence, why bother to change? One will get just as winded whether running a mile or a kilometer.

Who Will Pay For Reconversion?

ARTHUR A. MERRY
CHIEF TOOL ENGINEER
PRATT & WHITNEY AIRCRAFT

IT SEEMS TO ME that Mr. Rylander has overlooked a considerable number of vital factors which have a direct bearing on the adoption of the metric system. We are told that conversion to metric would be ever so profitable, but I cannot find specific examples to support that claim.

One of his closest references to the economics of the arrangement is where he mentions, "We can insure almost immediate postwar mass employment by adoption of the metric system." I am sure that if the solution of this number one problem facing us could be so easily solved, there would be a clamor from all over the United States to get on the metric bandwagon. I wish Mr. Rylander could give us more specific facts as to how he proposes to maintain this high level of employment. It certainly would be a God-send, for it would undoubtedly give a lot of people temporary work until the changeover was completed. But then what?

Who is going to pay for it, and what profit will come from paying for it? The men footing the bill will want to know.

It seems so easy to read that when you convert you gradually grow out of one system into another, but what about repair parts and spare parts? It means that every manufacturer will always have to maintain a duplicate set of tools—one to the American Standard, and one to the metric. At least the American Standard tools will have to stay in existence for 25 to 30 years, for there are a great many pieces of machinery and equipment that are going to be that old before they are worn out.

The thing I cannot gather from this article, or any other articles that I have scanned on this controversial subject, is where will we make enough savings to justify it.

I agree with Mr. Rylander, it is most convenient, but any man worthy of his hire that is working as a toolmaker, tool designer, machine designer, civil engineer, or pharmacist, knows his own units of measure and weight. It is just second nature for him. Adoption of metric means he would have to learn another language.

Mr. Rylander does not touch on the enormous task of re-educating old heads. Just think what it is going to mean when we are having enough trouble now trying to teach men to read blueprints and do simple mathematical problems with a system they are thoroughly familiar with. Certainly that is not going to be any pushover.

Mr. Rylander makes reference to the fact that we should change our system to the metric on the basis that countries using the metric are so far ahead of us. He certainly must realize that this country will, and is, out-producing any other one or two countries in the world today. It always has, and always will (I hope). If we are working with such an antiquated system, it seems to me that we do well with it. Knowing this makes me ask again—will conversion pay?

Now, if Mr. Rylander can give us concrete examples of where it is profitable, it would be smart business to make a complete shift over to the metric system. Any fair-minded person will go along with him on that basis. But just to do it as a matter of convenience sounds too much like a make-work plan that you would expect to come out of Washington.

HAVE USED BEST OF EACH

I do not think any one system will ever be perfect. We have been smart enough, however, to take and properly use the best of the American system and the best of the metric system. In the long run, that is far more sensible than making a complete change from one to the other.

If justification can be built up for making the change, the next big job is going to be teaching everyone a new basic language—so now we will all learn Latin. I am afraid that it will be a long time before we can hope for this. With most of the world back about as far as it can go, with a huge building plan ahead, why not have them convert to the American system? There is justification, and still you would get plenty of argument as to why they could not do it.

In words of one cylinder, "I'm agin it." THE END

Spiral Groove Self-Locking Bushings

• Spiral grooved, self-locking bushings, devised by the Planning and Wage Payment Department at General Electric's Erie Works, are adaptable to any fixture with members sufficiently large to accommodate liner and slip bushings. The bushings provide a positive locking feature which insures an efficient and accurate means of drilling, reaming and broaching brush-holder locating holes in motor magnet frames. These features are important in working to the close tolerances specified for the part.

The bushings are of various sizes. They are hardened and precision ground with a spiral groove incorporating a flat at the top which interlocks with a hardened pin inserted in the liner jig. The clockwise rotation of the drill, which holds the bushing in position, prevents it from being forced out of the jig during the drilling operation. The drill is well piloted and will not deflect or run, thus eliminating the possibility of drilled hole mislocation.

The conventional slip type bushing was ejected from the liner bushing by chips, allowing the cutting tool to deflect. This resulted in holes being drilled, reamed and broached out of location.

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NATCO ONE-WAY DEEP-HOLE *Driller*

EXAMPLE OF A TOUGH DRILLING JOB

This NATCO machine is drilling $^{33}/_{64}$" dia. holes $7^{13}/_{32}$" deep in two steel Breech Bodies simultaneously. The parts are revolved by the left-hand 7-speed head.

Of particular interest is the action of the right-hand HOLESTEEL unit. The drills are inserted in two non-rotating tool holders on the head of the unit. The head rapid traverses forward until the drills enter the work, drills to a prescribed depth, rapid reverses to withdraw the drills and relieve the chips, rapid traverses forward again, goes into feed, drills the prescribed depth again, and repeats the cycle until the holes have been drilled through. Then the head rapidly reverses to the starting position, all operations being automatic.

This is merely one example of the many operations performed by NATCO way-type machines which are built to do specific jobs of drilling, boring, chamfering, counterboring, reaming, tapping, etc.

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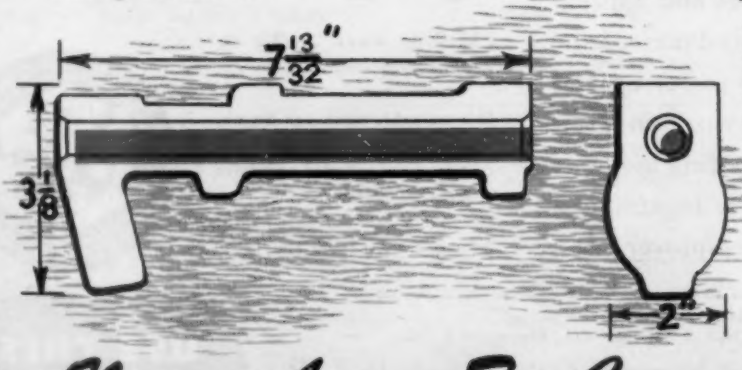
You are invited to send us your blueprints or have our field engineers make a survey of your requirements.



The sketches show the $^{33}/_{64}$" hole drilled to a depth of $7^{13}/_{32}$" in each of two steel Breech Bodies on the NATCO one-way deep-hole driller. This work is performed by step drilling automatically.

Production, 12 parts per hour.

NOTE.—Three methods of work and/or tool rotation are employed on NATCO machines:

1. Work may rotate and tools remain stationary as in the case of the machine here described.
2. Work may be stationary and the tools rotated.
3. Both work and tools may be rotated.

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PRODUCTION DATA SHEET

CENTER DIAMETERS FOR HEAVY WORK

C. N. FULLER
FARREL-BIRMINGHAM COMPANY, INC.

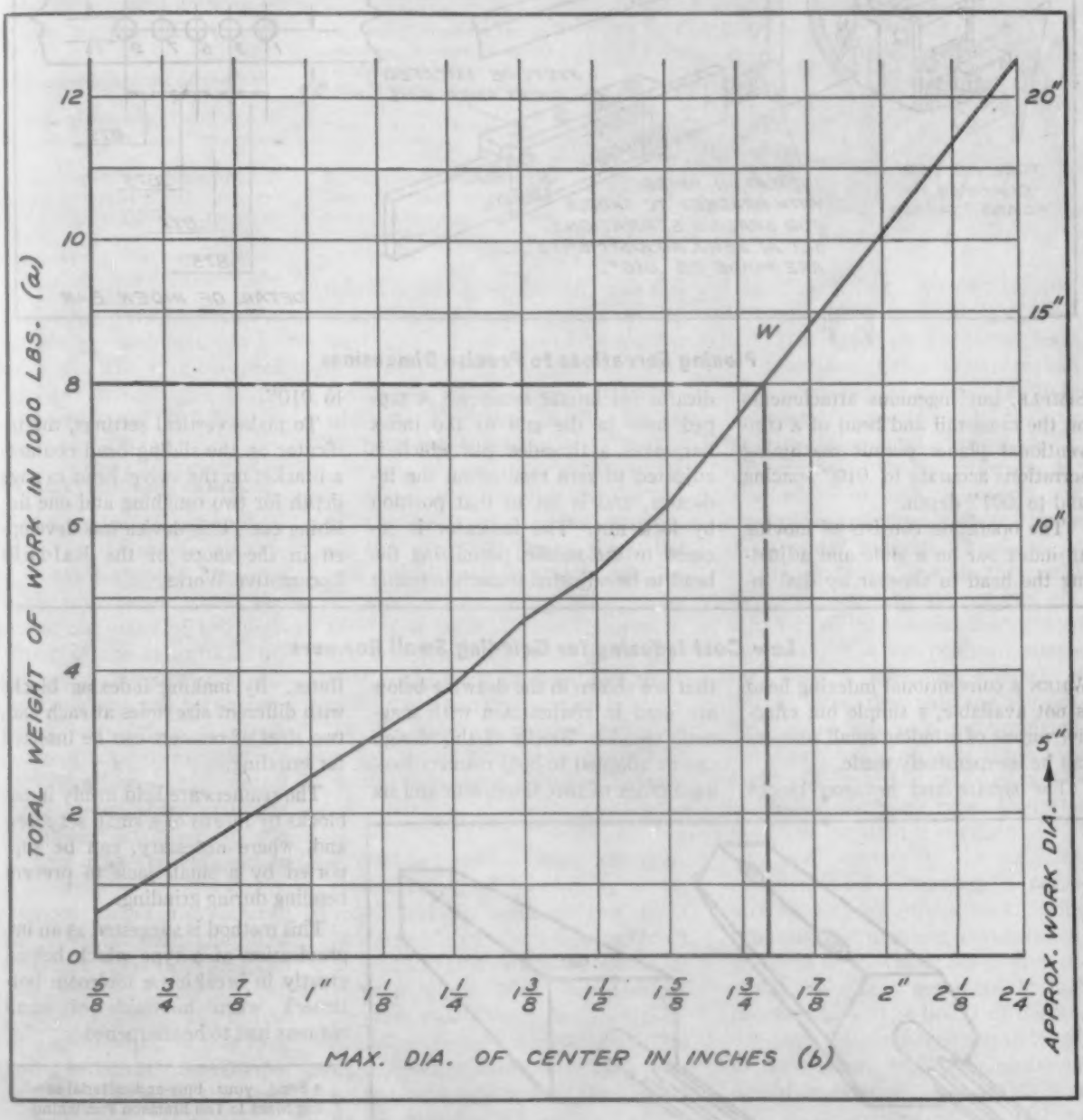
● General practice in determining the proper size of plain or live centers takes account only of the work diameter. With the specific gravity of materials covering a broader range, it has become increasingly important to relate the size of the center to the weight of the work.

Below is a chart, developed by practical shop experience, which relates the weight of heavy work to the maximum diameter of standard centers. The chart was developed by relating the weight of several typical jobs to the center diameter which had been found practical in experience.

The formula evolved from the data is:
where a equals the weight of the work in thousands of pounds and b equals the nearest standard center size. Using this formula, the curve W was plotted.

$$\frac{a^2}{50} = b$$

The broken line on the chart shows that for work weighing 8000 pounds, the nearest center diameter is 1-¾". The conventional method of relating center diameters to approximate work diameters is also shown.

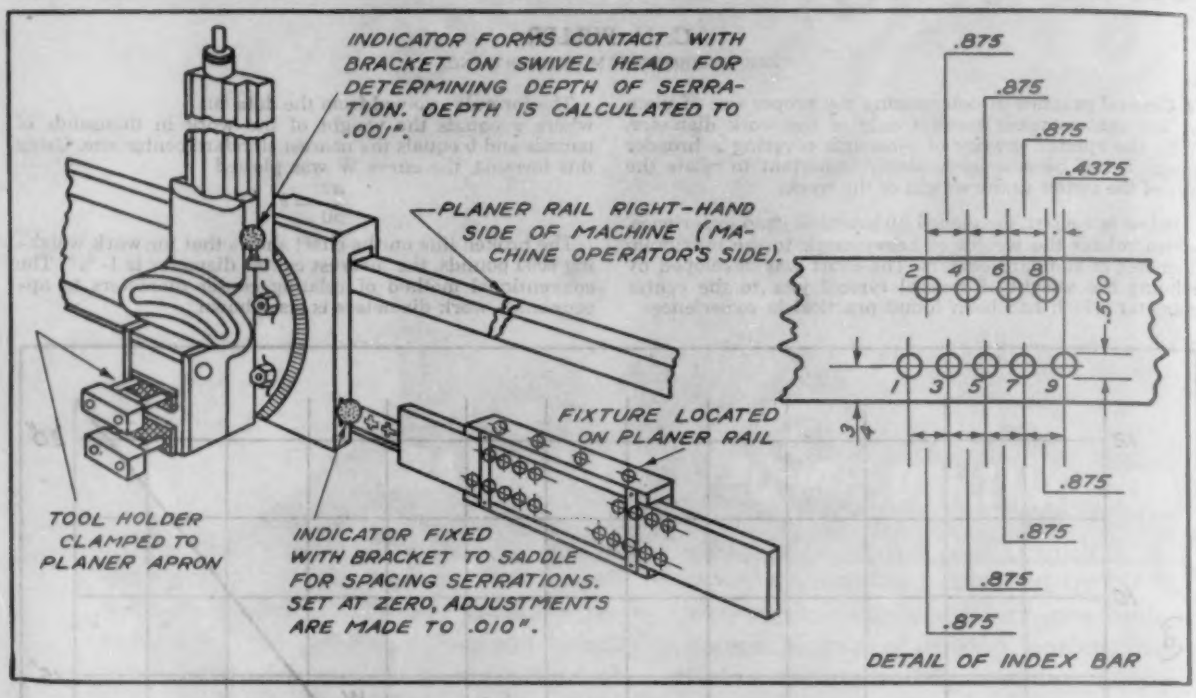


NOTE: This is the thirty-eighth of a series of Data Sheets to be published in THE TOOL ENGINEER. A handy three ring binder can be secured at any dime store to hold the sheets for quick reference.

THE CRIB

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

IDEAS · KINKS · SHORT CUTS


INDICATOR FORMS CONTACT WITH BRACKET ON SWIVEL HEAD FOR DETERMINING DEPTH OF SERRATION. DEPTH IS CALCULATED TO .001".
PLANER RAIL RIGHT-HAND SIDE OF MACHINE (MACHINE OPERATOR'S SIDE).
FIXTURE LOCATED ON PLANER RAIL
TOOL HOLDER CLAMPED TO PLANER APRON
INDICATOR FIXED WITH BRACKET TO SADDLE FOR SPACING SERRATIONS. SET AT ZERO, ADJUSTMENTS ARE MADE TO .010".
.875
.875
.875
.4375
.500
2 4 6 8
1 3 5 7 9
.875
.875
.875
.875
DETAIL OF INDEX BAR

Planing Serrations to Precise Dimensions

SIMPLE, but ingenious attachments on the cross-rail and head of a conventional planer permit machining serrations accurate to .010" spacing and to .001" depth.

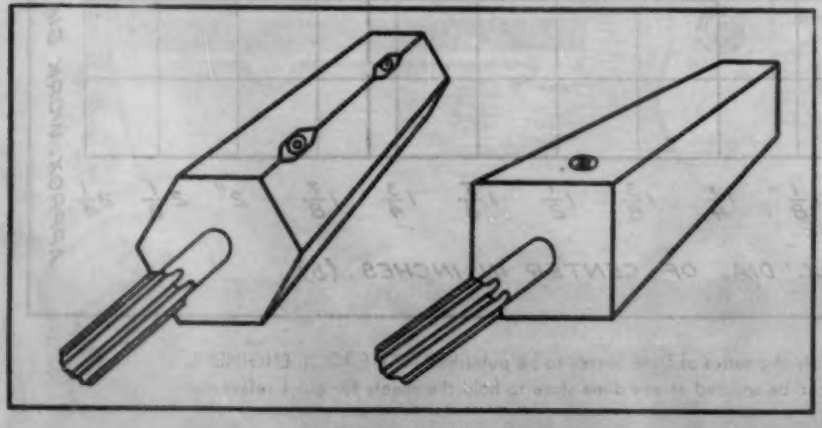
The operation consists of moving an index bar on a slide and adjusting the head to the bar by dial indicator for lateral settings. A tapped hole in the end of the index bar takes a threaded pin which is adjusted to zero reading on the indicator, and is set to that position by lock nut. The indicator is secured to the saddle, permitting the head to be adjusted to each indexing to .010".

To make vertical settings, the indicator on the sliding head contacts a bracket on the swivel head to gage depth for two roughing and one finishing cut. This device was developed in the shops of the Baldwin Locomotive Works.

Low Cost Indexing for Grinding Small Reamers

WHEN a conventional indexing head is not available, a simple but effective means of grinding small reamers can be inexpensively made.

The square and hexagon blocks that are shown in the drawing below are used in conjunction with magnetic chucks. Blocks of this design can be adapted to hold reamers having a range of two, three, four and six flutes. By making indexing blocks with different size holes at each end, two sizes of reamers can be inserted for grinding.



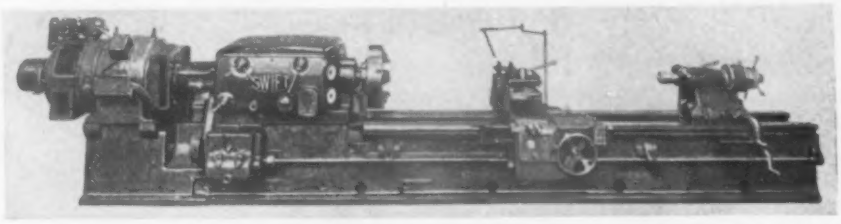
The reamers are held firmly in the blocks by means of a small set screw and, where necessary, can be supported by a small jack to prevent bending during grinding.

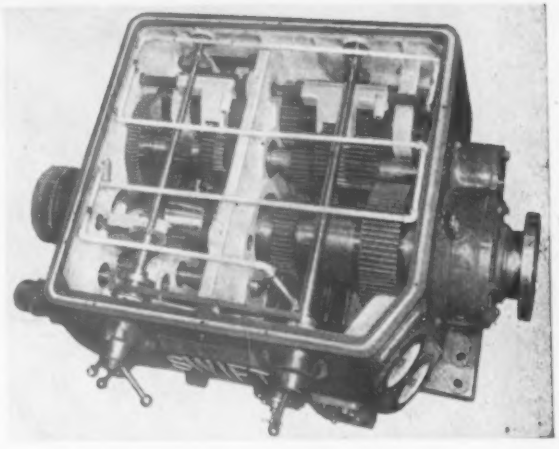
This method is suggested as an improvisation of a type which helped greatly in breaking a toolroom bottleneck when hundreds of small reamers had to be sharpened.

• Send your time-and-material-saving ideas to The Bramson Publishing Company, 2842 W. Grand Boulevard, Detroit 2, Michigan. Five dollars are paid for each idea published.

TOOL-TESTING LATHE

Direct drive from variable speed motor for high speed, with reduction to four lower speed ranges, and wide feed ranges, are features of this special lathe developed for experimental work by a British manufacturer





Special 15", 11-foot tool-testing lathe developed by Messrs. Swift & Sons, Limited, Halifax. Note direct drive, from variable speed motor, and dials on headstock to indicate spindle speeds and horsepower input. Modern push-button control provides for increase or decrease in speed according to length of time the button is depressed.

Swift & Sons photos

Right: **Headstock gearbox, showing direct drive, and provision for speeds in the lower ranges.**

To meet the broad requirements of testing single-point tools, Swift & Sons, Limited, Claremont Ironworks, Halifax, have developed a special 15"—11-foot tool-testing lathe. Tools can be tested on work of sufficient size to provide extended runs.

The three main functions of the lathe are:

1. Testing cutting tools of high-speed steel, substitute steels, and cemented carbide.
2. Investigation of the machinability of work of different metals and determination of the machinability index of the metals.
3. Testing cutting oils on different metals at varying spindle speeds and tool feeds.

Direct spindle drive, through a flexible coupling, is provided for high-speed work. The variable-speed motor develops 30 hp at its lowest speed of 600 rpm and 75 hp at its highest speed of 1500 rpm.

SPEED CONTROL AND RANGE

Speeds are controlled either from the headstock or the saddle, and are indicated on a tachometer, a large dial being visible from either point. The tachometer is the upper of two dials on the front of the headstock, the lower dial being an ammeter graduated in both amperes and horsepower so that power consumption is continuously indicated. Speed variation of the motor is effected by control push buttons, the speed automatically rising or falling according to the length of time that the appropriate button is depressed.

Lower speed ranges are obtained by sliding reduction gears contained in the headstock. Four spindle speed ranges are provided: 17 rpm to 40 rpm; 40 rpm to 100 rpm; 100 rpm to 250 rpm; and 250 rpm to 600 rpm. The highest speed range from 600 rpm to 1450 rpm, is provided by the direct drive.

The illustration of the gear box shows the direct drive hookup. The flange of the flexible coupling to the motor is shown on the left, and the flanged spindle nose appears on the right. The front journal of the spindle is 7" in diameter and runs in twin-opposed Timken roller bearings, while the 5½" rear journal runs in Hoffman ball bearings.

Speed ranges are selected by movement of three levers at the top of the headstock, which actuate, through rack and pinion gears, the gear shifting dogs which can be identified in the gear box photo by their light color. Interlocks between the levers and actuating gears prevent engagement of the direct drive while the reduction gears are in mesh. The hardened and ground reduction gears slide, generally on splined shafts. They run in a filtered oil bath.

TWO FEED RANGES

Feed-box change gears are gear-driven from the headstock by an external train of gears covered by a guard and fitted with a slipping clutch to protect the gears from accidental damage or overload. An interlock prevents coarse feeds from being engaged when high spindle speeds are used. Feeds are controlled by a lever on the headstock and by three levers on the feedbox.

Two feed ranges are provided, both having nine steps. Longitudinal feeds are, in "cuts per inch", coarse range, 10.5, 15, 21, 28, 39, 54, 72, 100, 140, and fine range, 83, 120, 165, 220, 310, 430, 580, 1120; the feeds are reversible. Cross feeds are half these rates, and are given to the front tool post of the saddle only, the rear tool post being hand adjusted.

There is, of course, provision for hand travel of both the saddle and cross slide, while the saddle has also a quick power traverse. The saddle is massive and rigid, and has the manufacturer's standard type apron embodying nickel-chrome heat-treated steel gears. The tool posts are simple and have a minimum number of mating faces, thus reducing the possibilities of weakness and springing. The front tool post is of the square turret type and the rear-tool-post is of the bolt-and-plate type. Diameter stops can be fitted if required.

A live center in the tailstock mounted in roller bearings, is necessary for long high-speed tests. Spring compensation provides automatic adjustment of the center when work expands from heat generated in high speed turning. The bed is of massive one-piece construction. Overall length of the machine is 25 feet, and total weight is 15 tons. The End

•

Material for this article appeared originally in the British publication, *Engineering*.

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PLASTICS FOR TOOLS

THOMAS A. DICKINSON
CONSOLIDATED VULTEE
AIRCRAFT CORPORATION

Because it has found several plastics more economical than metal on numerous applications, Consolidated Vultee is now using them extensively on tooling. Shown here is the pouring of liquid plastic into a sheet mold.

DESPITE A WELTER of optimistic announcements, plastics have not yet replaced metals as the principal ingredient in aircraft tooling. However, according to L. C. Wilson, supervisor of plastic tooling for the Manufacturing Research department of Consolidated Vultee Aircraft Corporation, some extremely interesting uses have been found for both thermosetting and thermoplastic materials in this important phase of aircraft manufacture.

"Mistakes have been and are still being made in thinking that plastics are a cure-all for tooling," says Wilson. "This is not true, because plastics have their limitations the same as other materials. In some respects, certain plastics are better than metals; but in other respects, they are definitely inferior. Therefore, we have found it possible to utilize these synthetics only on certain specialized jobs."

The two most important tooling plastics now being used by Consolidated Vultee are Toolite and Plastalloy. Toolite is a thermoset material, while Plastalloy is a thermoplastic. As used here, the terms "thermoset" and "thermoplastic" respectively denote those materials which become solid by heating, and those which change to a solid on cooling.

Generally thermoset plastics have great compressive strength and low impact resistance; while thermoplastic materials have considerable impact strength and low resistance to compression. Accordingly, these two general types of plastics cannot be used interchangeably.

Toolite is used in fabricating hydropress form blocks, stretcher form blocks, router and saw fixtures, checking fixtures, etc. Plastalloy is most valuable in making drophammer and double-action press punches, where impact rather than compressive strength is essential. Thus, by making a punch from Plastalloy and a pressure pad or female die from Toolite, Consolidated Vultee has found it possible to make a complete double-action press tool without the use of metal.

However, all this is not quite as simple as it sounds. The fabrication of Toolite implements, for example, requires careful engineering thought and design. Although this remarkable material has a compressive strength of from 15,000 to 20,000 p. s. i., it is somewhat brittle and can be easily chipped—especially along the edges. Among other things, Toolite form blocks must have a generous radii on all corners and edges. The minimum radii observed is, or should be, $\frac{1}{8}$".

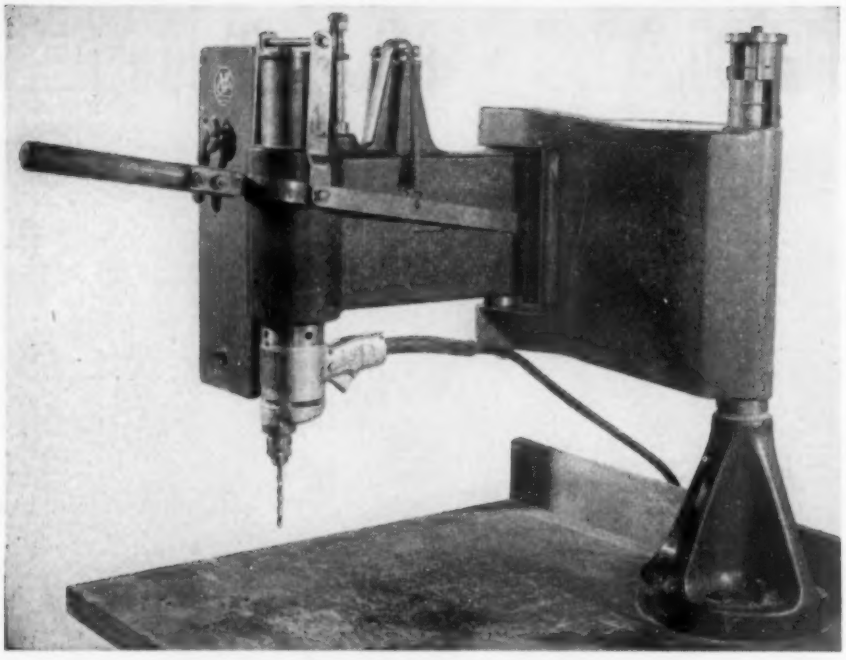
Wilson further observes these general rules with regard to fabrication of thermoset plastic tools:

"Bolts, screws, and inserts should be placed not closer than six times their respective diameters from each other. Never locate bolts, screws, or inserts closer than one inch from the edge of the tool.

"Drift pins and tapered pins should never be used; this is apt to cause internal strains and stresses which will cause the tool to crack.

"Care must be exercised in mold construction. Wood, plaster, metal, or even thermoset materials themselves can be used for the molds. The mold

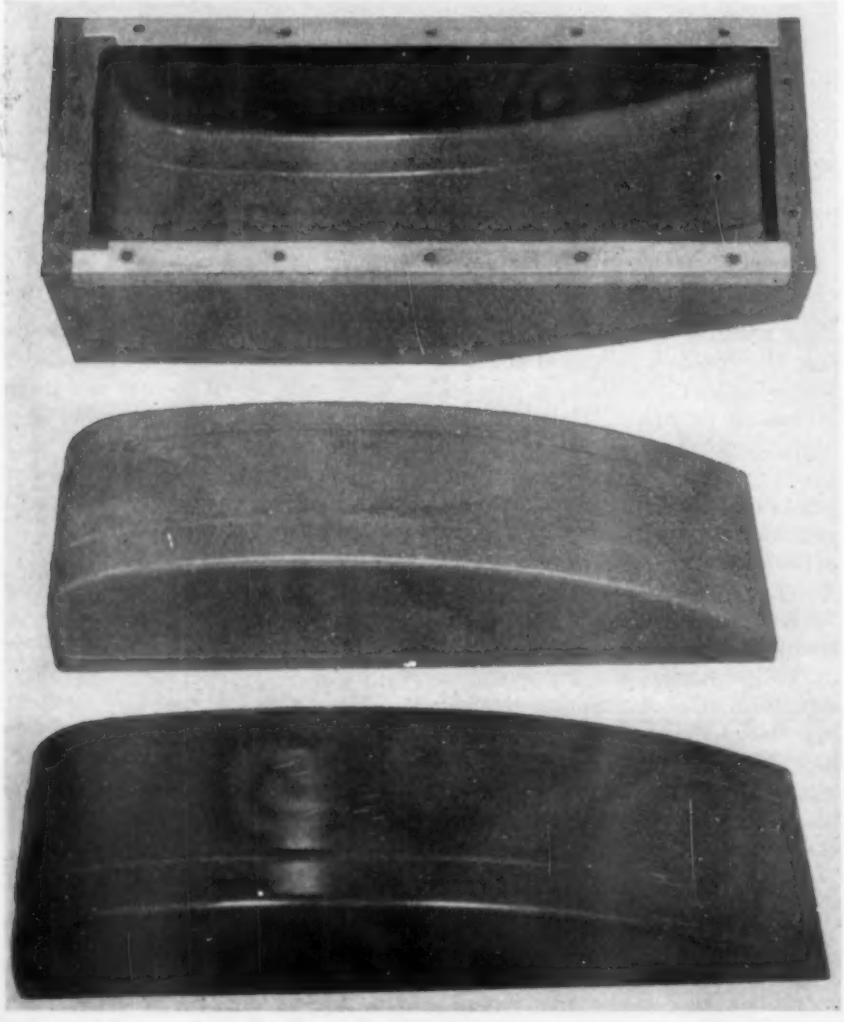
Because plastic tools can be fabricated more rapidly and economically, one aircraft builder predicts for them even wider postwar use



Base and arms of this radial drill press were made from plastic. Drill presses of this type are standard equipment at Consolidated Vultee.

Consolidated Vultee photos

Male and female plastic hydropress form blocks now used to form sheet metal parts by Consolidated Vultee at San Diego.



should be coated with a high gloss acid-proof paint, with wax as a parting agent, and it should be remembered that the finished surface of the plastic tool is only as good as the finished surface of the mold. If the mold is properly finished, no after-finishing of the Toolite casting will be necessary."

ACCURATE SURFACE REPRODUCTION

SINCE a thermoset plastic will completely fill its mold while curing, Toolite reproduces—with almost minute accuracy—the surface of the form in which it is cast. Mold shrinkage is negligible, but there is some thermal contraction when the material is cooled to room temperature. The latter amounts to only about 1/32″ per foot; but even this must be taken into consideration in mold construction, if exact dimensions are required.

One of the most desirable features of Toolite is its machineability. It can be formed with any metal or woodworking tool such as a router, joiner, planer, or bandsaw. It can be filed or sanded and buffed to a glossy finish, and it can be drilled or threaded for any type of screw.

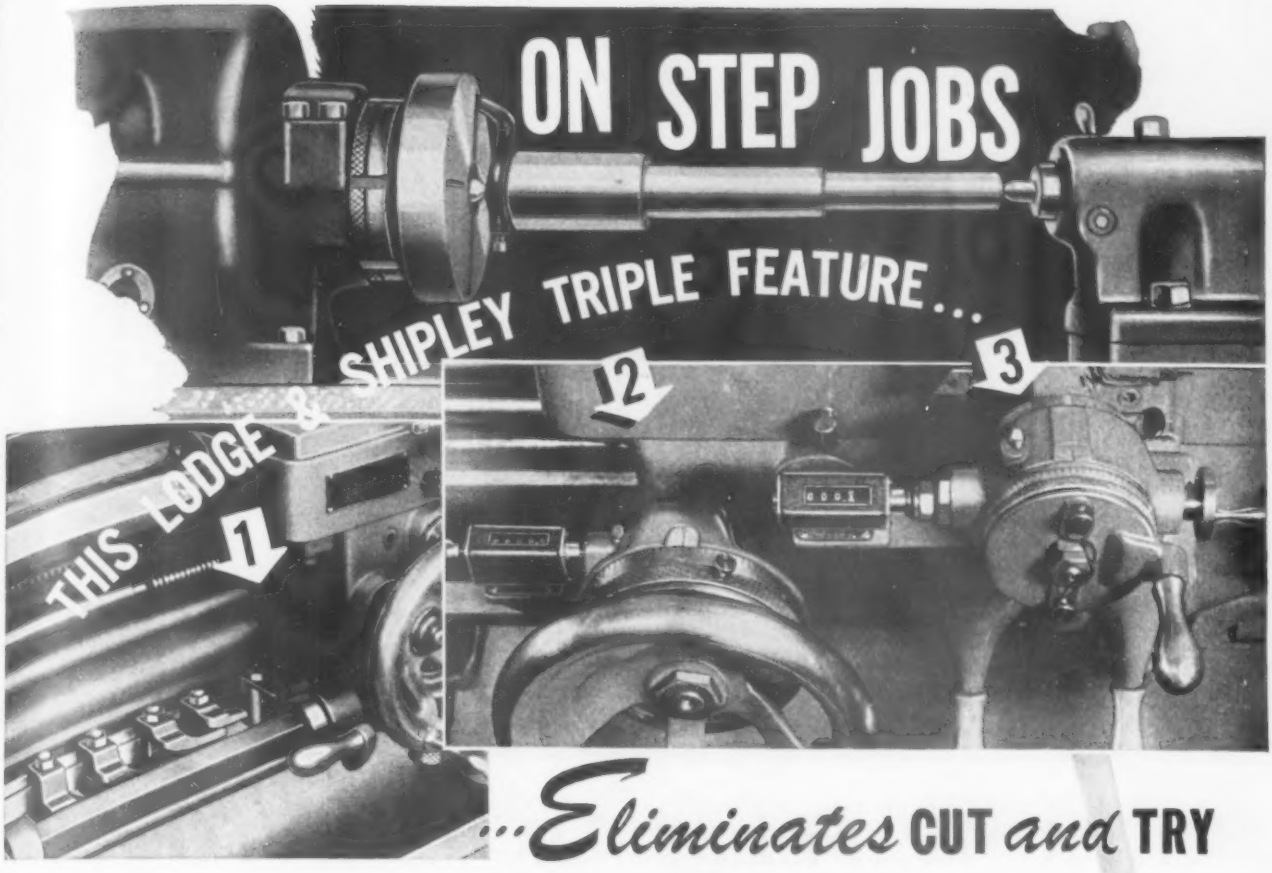
In sheet form, two or more Toolite sheets can be fused together with the same resin, the bond producing a strength equal to that of the bonded pieces. If simple form blocks are desired, it is only necessary to cut a sheet to its required dimensions. Saw and router fixtures may be fabricated by cutting sheets to the proper dimensions and cementing them together.

Thermoset plastics set or become hard by means of a process called "polymerization," which includes the formation of many different structural formulae with a common empirical formula. This process takes place constantly, and may be increased by the addition of heat, catalyst or accelerator to the ingredients of the plastic. That is why thermoset plastics in storage should not be subjected to sun rays or excessive temperatures.

TEMPERATURE EFFECTS

Thermoplastic materials are amorphous and gradually change from a solid to a liquid when heated. At low temperatures, they become brittle and can be easily broken. Therefore, if they are to be used in the form of tools, they should be preheated to a temperature of approximately

(Concluded on page 132)



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Determining the exact diameter and length of a work-piece being machined on a Lodge & Shipley Lathe is a matter of easy reading. Micrometer Dials and Counter Arrangements (Figs. 2 and 3) for either length or diameter, after being properly set, indicate when the exact dimensions desired are attained.

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On lathes equipped with multiple length stops (Fig. 1), settings for step jobs can be accomplished quickly. After the first stop dog has been set, the correct settings for the balance of the stop dogs are made, using the Length Dial on the apron (Fig. 2) to determine exact shoulder positions.

The stop dogs, used in conjunction with the Dial and Counter, automatically disengage the feed at each shoulder. The apron lever (Fig. 1) when raised re-engages the feed after the tool is set for the next required diameter. In this manner, successive cuts are accurately established with minimum effort.

These and other Lodge & Shipley developments—to simplify lathe operation—permit important time savings, reduce spoilage and lower costs whether the operator is a beginner or experienced. For more complete details call on Lodge & Shipley Engineers or write on your company letterhead for booklet No. 495-B.

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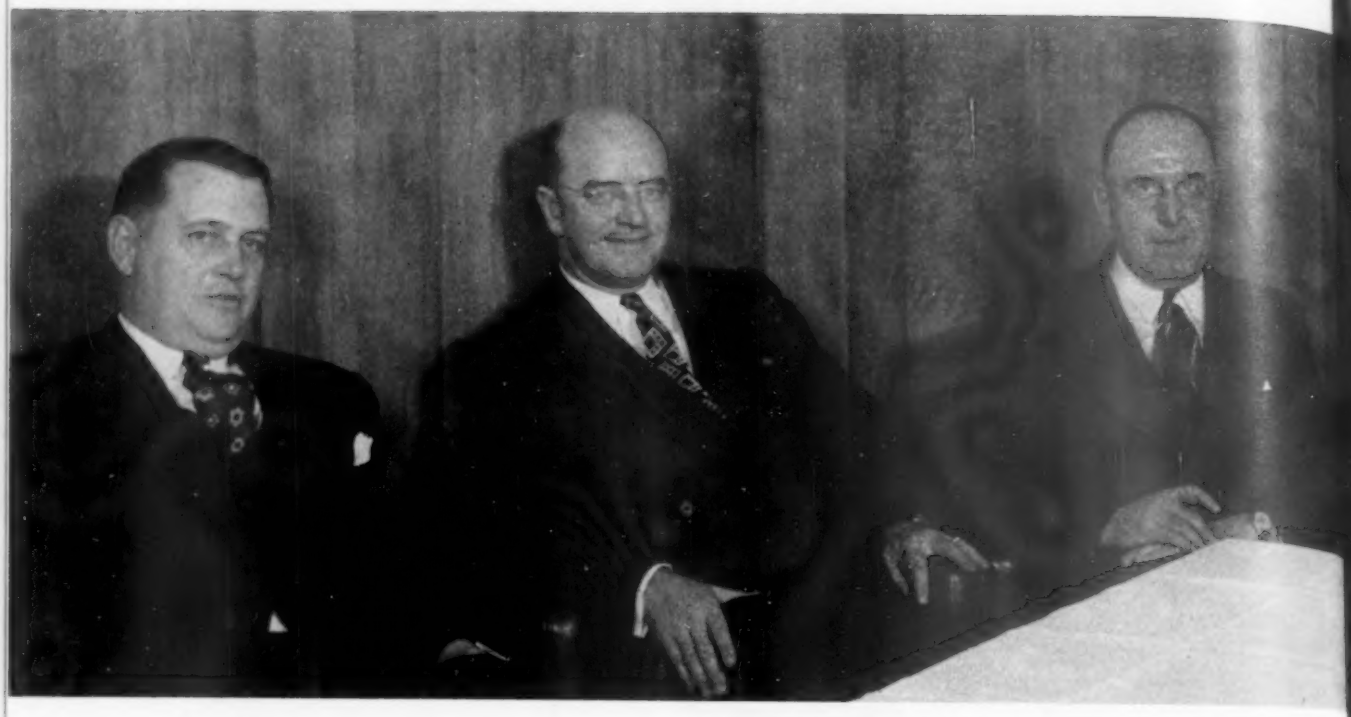

DETROIT SEES MACHINE TOOLS AS KEY TO PRODUCTION COSTS

DISCUSSING the role production engineering can play in compensating for inevitably higher postwar manpower costs in mass manufacturing, six prominent executives identified with Detroit industry foresee solutions in improved production management, worker incentives or better supervision, and increased machine tool productivity through design changes.

As participants in the eighth in the nation-wide series of PRODUCTION Round-Tables conducted by the editors of this magazine, the Motor Capital production men sketched in broad strokes their personal opinions on future trends in mass manufacturing as well as machine tool requirements and markets in their own industries.

HELD IN BIG MACHINE TOOL MARKET

This meeting, held November 6 in Detroit, reflected the thinking of men in an area generally expected to become the largest single postwar machine tool market. Already, as pointed out by Bramson editors at the meeting, 90 percent of the approximately $46,000,000 in postwar machine tool orders placed since mid-August have come from Detroit.

Participants in the Round-Table at the Detroit Athletic Club were W. H. Smila, Master Mechanic, Plymouth Plant, Chrysler Corporation; W. F. Wagner, Assistant General Superintendent, Willow Run Plant, Ford Motor Company; J. R. Weaver, Manager, Naval Ordnance Plant, Westinghouse Electric & Manufacturing Company; L. J. Jacques, Vice President & General Manager, and R. E. Sharpe, Factory Manager, Motor Products Corporation; and H. T. Johnson, Director, Production Engineering Section, General Motors Corporation.

Thinking expressed on the postwar manufacturing outlook in general and machine tool design in particular was significant and interesting from the standpoint of the actual production backgrounds of the six participants.

VARIETY OF PRODUCTION REPRESENTED

The epitome in mass manufacture was represented by the auto men from Ford, Chrysler and General Motors; the peculiar middle-ground of auto parts production was presented by the men from Motor Products; and the outlook of the super-job shop was offered by the Westinghouse executive.

Although each of the participants had his own ideas on postwar machine tool design requirements, Round-Table discussion immediately centered on the much publicized General Motors machine tool analysis and specification program. Opinion on certain specific machine tool specifications proposed by GM was far from unanimous, with sharp differences of opinion offered on machine control methods.

Johnson, explaining the background of the machine tool analysis and educational project being conducted by General Motors, traced the history of the study back to September 1943. "This machine tool program is actually a part of the Corporation's postwar planning," he said. "It resulted directly from a search for ways to cut costs in war production and reduce estimated operational costs in our postwar production program."

This study, he stated developed into two categories. These are maintenance and motion study. "Few production men ever realized in figuring the cost of machine tool maintenance," he said, "that actual maintenance labor costs amount to only 10 per cent of the total costs of upkeep or downtime.

"Study of this problem revealed that a good share of the actual cost of machine repair can be charged to the streamlining of machines that has resulted in enclosed motors and controls," he continued. "When motors are inside the bases of machines it often requires as much as two hours just to get them out where they can be worked on. If they were placed on the outside of the machines they could be reached immediately and replaced, if necessary, simply by unbolting and lifting away."

MACHINE STREAMLINING CRITICIZED

Charging streamlining with making controls equally hard to get at, the GM engineer explained that these conclusions were reached through an investigation carried on in more than 100 shops of the Corporation.

Believing that the solution to the problem of achieving lower product unit cost lies partly in increased machine productivity, GM engineers pursued a study of the motions of machine

Bramson photo

Production executives from Ford, Chrysler, General Motors, Westinghouse and Motor Products were participants in the eighth in the nation-wide series of PRODUCTION Round-Tables conducted by the editors of this publication. Offering their own opinions on postwar trends in mass manufacturing and machine tool design requirements were, *left to right:* R. E. Sharpe and L. J. Jacques, Motor Products Corporation; W. F. Wagner, Ford Motor Company; H. T. Johnson, General Motors Corporation; W. H. Smila, Chrysler Corporation; and J. R. Weaver, Westinghouse Electric & Manufacturing Company.

operators at work.

"With less time spent in operating controls," Johnson reasoned, "machine productivity certainly will go up." Through changes in control locations and improvised control setups, he said, Corporation engineers have been able to step up materially the output of individual machines.

Johnson's definition of motion economy is simply "the least number of the shortest motions possible on the part of the operator not only to operate the machine, but also to load and unload it." Reduce the time consumed in operator motion, he pointed out, and you reduce the overall time required to complete a series of operations on any machine.

After building up much factual data, the auto producer finally revealed the results of its machine tool study late this year. "The big surprise," Johnson said, "was the immediate interest shown by the machine tool builders."

GM MACHINE TOOL RESEARCH

Importance of machine tool design to the entire automobile industry is indicated in the activities of General Motors, the country's largest single purchaser of metal-cutting equipment.

"GM has gone into this subject so thoroughly because it feels that machine tool improvements—greater productivity and lowered maintenance costs—are the paramount ways to reduce consumer product costs after the war." Johnson said, "The best product designers in the world are unable to suggest ways of substantially reducing automotive product costs through the use of new designs or new materials immediately after the war."

With Smila of Plymouth and Wagner of Ford concurring, it was reasoned that since labor costs undoubtedly will be higher after the war than before, automotive costs can be brought down only through utilization of new and improved production techniques and of machines with higher productivity.

GM research on the subject of machine controls, it was revealed at the Round-Table, has led the Corporation's production engineers to favor the use of mechanical and electrical controls rather than hydraulic systems. "If a builder can do the job as well mechanically as he can hydraulically, we believe he should do it mechanically," Johnson said.

This statement was in sharp disagreement with one by Wagner, who pointed to the outstandingly successful applications of hydraulics on special machines used in engine manufacture at the Ford Rouge plant, as well as on batteries of body parts presses used by the pioneer automobile builder.

"It is amazing what little trouble we have with hydraulics," the Ford engineer said. "Once you get a machine in operation, seal up the valves to keep operators away from them and you have a unit that will run indefinitely. Temperatures are the only curse of hydraulics and that will be overcome.

Admitting that there are certain applications for hydraulics that cannot satisfactorily be replaced by other methods, Johnson insisted that there are "certain maintenance problems imposed by hydraulics that you can't get away from. We are not having the trouble training electronic maintenance men that we are in training hydraulic maintenance men."

Rumors that General Motors contemplates or ever contemplated going into the machine tool business or building its own machines in normal times are completely unfounded, Johnson stated. The Corporation, he said, prefers to call in established machine tool builders, give them details on each production problem and let their experienced personnel tackle the job.

On the other hand, Weaver of Westinghouse explained that because of the ever changing production requirements faced in manufacturing a wide variety of industrial equipment and household appliances, his company maintains a special machine design and building department. Many of the design problems undertaken by this Westinghouse department, he admitted, really fall into the category of special equipment for electrical parts manufacture and aplications for standard machine tools.

This machine design department actually is a part of the Westinghouse Central Manufacturing Department, one of the most unique production engineering organizations in operation today. Central Manufacturing, located at the Company's Pittsburgh headquarters, is the nerve center of production in all Westinghouse plants.

As new products are developed, they are sent to Central Manufacturing, Weaver explained, where they are studied from the standpoint of material and production facilities require-

(Continued on page 134)

4 BIG BENEFITS FROM 1 SIMPLE CHANGE*

1. More pieces between grinds
2. More grinds per tool
3. Less down time
4. Lower tool cost

*A CHANGE TO TECO CEMENTED CARBIDE has enabled many plants to substantially step up turning, boring and facing production, while cutting cost per piece and cost per tool. You can do the same in your plant.

MAKE THIS CHANGE! Replace your present carbide tools with TECO Cemented Carbide, on any machine. Run exactly as before—then check the extra pieces produced.

TECO Cemented Carbide has greater resistance to wear and breakage because it is harder, denser, more uniform. Send details of your operation—or have a tool engineer discuss your needs. Catalog and price list on request.

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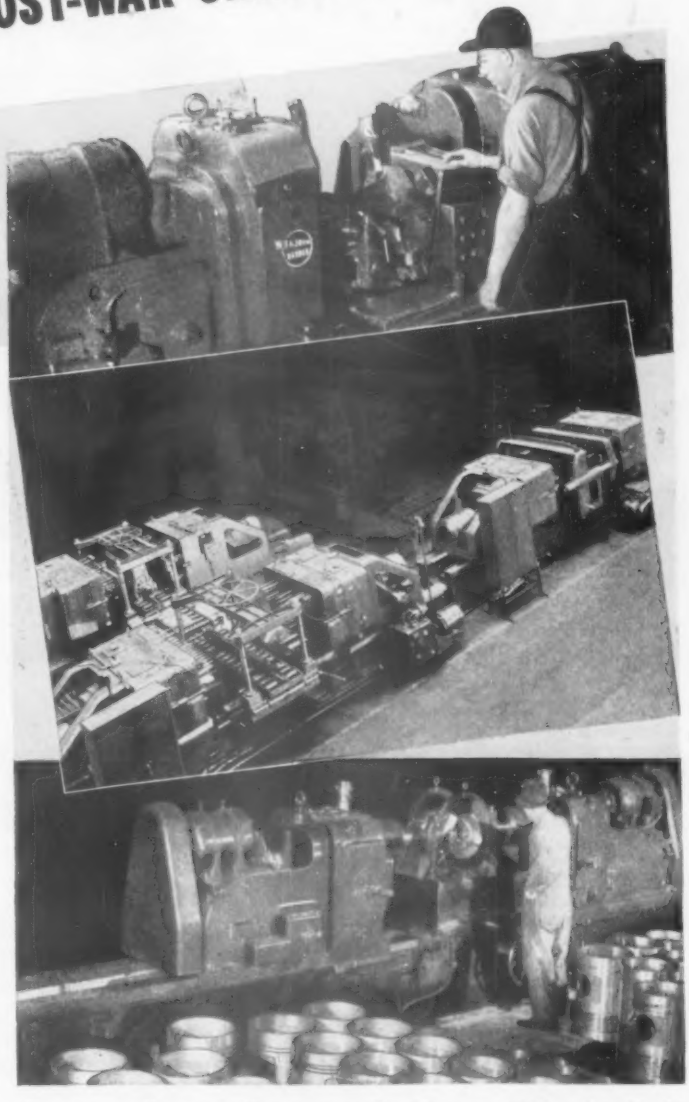
CEMENTED CARBIDE

HOW TO CUT PRODUCTION COSTS NOW AND POST-WAR CHANGE-OVER COSTS!

W. F. and John Barnes Unit-Type Machines Produce More Parts... Are Easier to Rearrange and Re-tool



These are the war production records of three Barnes special purpose machines used for drilling, milling, boring, tapping, reaming and similar operations. Unit-type construction makes such records possible. Later, these machines can be readily rearranged and re-tooled to manufacture post-war parts and products.

This machine (top illustration) rough and finish bores three holes simultaneously in a tough steel casting. Tolerances are held to .003″ on all holes. Previous production time on other equipment was 62½ minutes. Present time including a milling operation is 39 minutes per piece.

Three W. F. and John Barnes Unit-Type Machines in production line drill and tap cylinder blocks. Heads and holding fixtures were designed and built by the motor manufacturer to suit unit-type machines. Production jumped from 720 to 2000 blocks per month. Cost was cut from $13.75 to $7.50 per block. This is an excellent example of results obtainable when product manufacturer and our engineers collaborate on production problems.

Free PRODUCTION & RE-TOOLING IDEAS FOR CONVERSION

These are but a few of the helpful bulletins which show how W. F. and John Barnes Unit-Type Machines can be adapted to fit post-war needs. Write for a complete set today and have this information ready for your needs tomorrow. Ask for Bulletin No. 1244.

W.F. & JOHN BARNES

Two opposing spindles are used with two sliding head self-contained hydraulic units to bore and counterbore piston pin holes on this Barnes duplex machine. The piston pin holes are completed in two operations with finish dimension held to .001″. Original boring time on this piston was 45 minutes each. Present time is 20 minutes.

While all these machines are now being used for special work, they can be easily changed to produce other parts equally well. Barnes engineers will be glad to help you with your present and post-war machining problems. Let us recommend equipment for your needs.

W. F. and JOHN BARNES

325 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

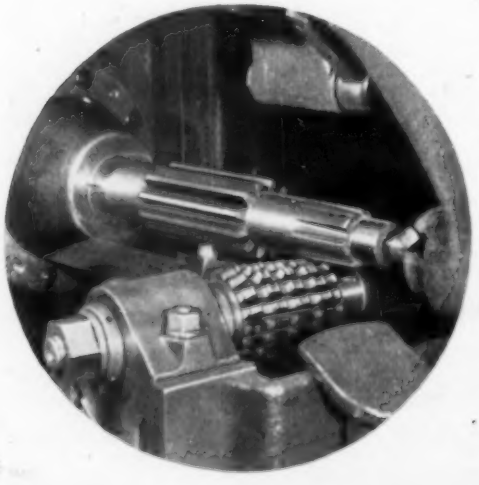
ANOTHER EXAMPLE OF

BARBER-COLMAN HOBBING PERFORMANCE

Buy War Bonds

The piece shown here is part of a tank drive. It is an NE 8720 special forging, hobbed soft. The 6-key taper spline is 1.750" dia. and 2⅛" long with a minimum root dia. of 1" and a key width .439"-.438". A feed of .051" per revolution of work and a hob speed of 139 r.p.m. produces 60 pieces per 8-hour day. One operator runs 3 machines. The B-C Hobs give 200 pieces per grind and 5000 pieces per hob.

TAPER SPLINE HELD TO CLOSE LIMITS ON B-C TYPE "T" HOBBING MACHINE



The taper spline shaft end, featuring greater strength, reliability and accuracy of mounting can be produced accurately and economically on a Barber-Colman Type "T" Hobbing Machine. Here is an example in which one key of the taper spline must be located within .001" of the center line of the pinion tooth and all six keys held equally spaced within .0005". This was accomplished using a special locating arm mounted on the spindle housing, as illustrated. The B-C Type "T" Hobbing Machine provides a means for production hobbing to close limits without difficulty, maintaining a specified relationship, and providing high degree of accuracy. It offers as well three distinct methods of feeding through the work: conventional, tangential and oblique. The added feature of these three methods naturally increases the versatility of production on the machine to include work such as worm gears, helical gears, spur gears, straight splines and other non-helical tooth forms.

BARBER B-C COLMAN PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

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MACHINE TOOLS

. . . news and trends in the Machine Tool Industry . . .

September Shipments Rise; New Orders Drop Back

Continuing the upward climb renewed last August, machine tool shipments rose another two per cent in September to a total value of $35,876,000. This volume, according to figures gathered by WPB from 199 manufacturers, is almost $700,000 over August shipments.

On the other hand, net new orders—total orders less cancellations—dropped back to $33,013,000, reflecting the end of buying for the heavy ammunition program and new Navy and Air Force jobs launched during the summer. In comparison, net new orders received by the industry during August totaled $40,024,000.

Builders made a small dent in their backlog during September, cutting it 1.6 per cent to a total value of $193,682,000. The August backlog totaled $196,760,000. If builders can maintain their present production pace, according to the Government agency, 5.4 months will be required to fill the orders on hand as of the end of September.

In its most recently released figures, WPB states that "about $9,298,000 of the September backlog is for unrated orders." In contrast with this statement, John S. Chaffee, WPB Machine Tools Director, speaking before the machine tool builders assembled for their Annual Meeting, October 20, presented a different set of figures.

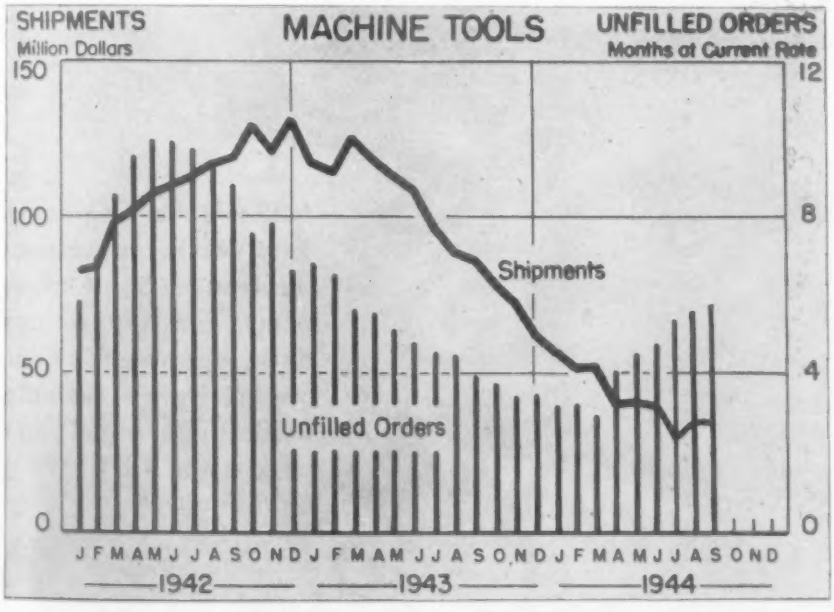
In sketching for the builders a picture of the character of the machine tool backlog as seen from the Washington viewpoint, he said that WPB had up to that time approved $46,000,000 in unrated "reconversion" orders. But, he pointed out, builders have reported only "$7,000,000 worth", indicating that $39,000,000 in orders are kicking around industry offices.

Even though ordering of machine tools for war production is again tapering off, the especially critical demand for machines in the heavy ammunition program is causing Washington worry about the increasingly serious manpower problem in the industry.

From 78,000 wage earners in the industry on December 31, 1943, the number shrank to 57,300 last August, and dropped further to 53,900 in September. Consequently, both WPB and the War Manpower Commission are now struggling to stem the flow of workers—skilled and unskilled—from the machine tool plants of the nation.

The combined efforts of the Government agencies to solve the machine tool industry manpower problem may be better late than never. For months the industry has been pleading for Government assistance in its manpower difficulties. At WPB - Machine Tool Industry meetings early in the year, it was pointed out by the builders that unless something was done to halt the loss of workers in their plants shipments would fall off and a really critical situation might develop.

Now, months later, Washington is attempting to plug the hole in the dike.



Continuing an upward climb commenced in August, machine tool shipments rose again in September to a total value of $35,876,000. This was almost $700,000 over the value of August production. On the other hand, new orders dropped from $40,024,000 in August to $33,013,000 in September, causing the industry backlog to level off at approximately 5.4 months' work.

DPC Tackles Surplus Storage Problem, Plans Warehouses

What to do with the unwanted Government-owned machine tools in their plants when war production contracts are cancelled has long been the number one problem in the reconversion plans of many a manufacturer.

Last month the pattern of Government planning on reconversion crystalized to the extent that a program for removing and storing surplus machine tools was revealed. Highlights of this program are preparation of plant clearance plans, to be shelved until war contracts are cancelled, and erection of special buildings for storage of Defense Plant Corporation machines.

In some cases where Government-owned machinery already has become unnecessary on war production, DPC has had it moved out of privately owned plants and stored at Government expense. DPC field men are now mapping out plant clearance programs with individual contractors, and plans for about 20 per cent of them are said to have been completed and filed for use when war contracts are cancelled.

Prefabricated warehouses to serve as storage and sales centers for surplus equipment are now being erected in key manufacturing centers by DPC and its parent, Reconstruction Finance Corporation. Size of these warehouses is said to range from 1,000,000 to 1,500,000 square feet each. In Washington it is said that DPC is beginning to purchase 6,000,000 square feet of corrugated iron structures that can be thrown up in a hurry.

In Detroit, where reconversion-conscious automobile producers have been demanding action on a program for speedy removal of Government-owned machines from their plants when war contracts are cancelled, the removal of a few machine tools has started.

Motor car manufacturers, however, are not satisfied that this initial stab at the Herculean task means that all will go well. Automotive War Production Council plans call for "keeping the heat on this situation", continuing to demand that the Armed forces declare promptly that machines are no longer needed when war contracts are cancelled, and that DPC or the Services permit or assist in the removal of surplus machines and materials from automobile shops.

Size of the Government-owned surplus machine tool problem will be unbelievably large. After World War One, the United States Government found itself owner of 80,000 machine tools. This pool of ready-to-use machines is believed to have been the basic cause of the deflation in the new machine market that took the industry fully 10 years to overcome.

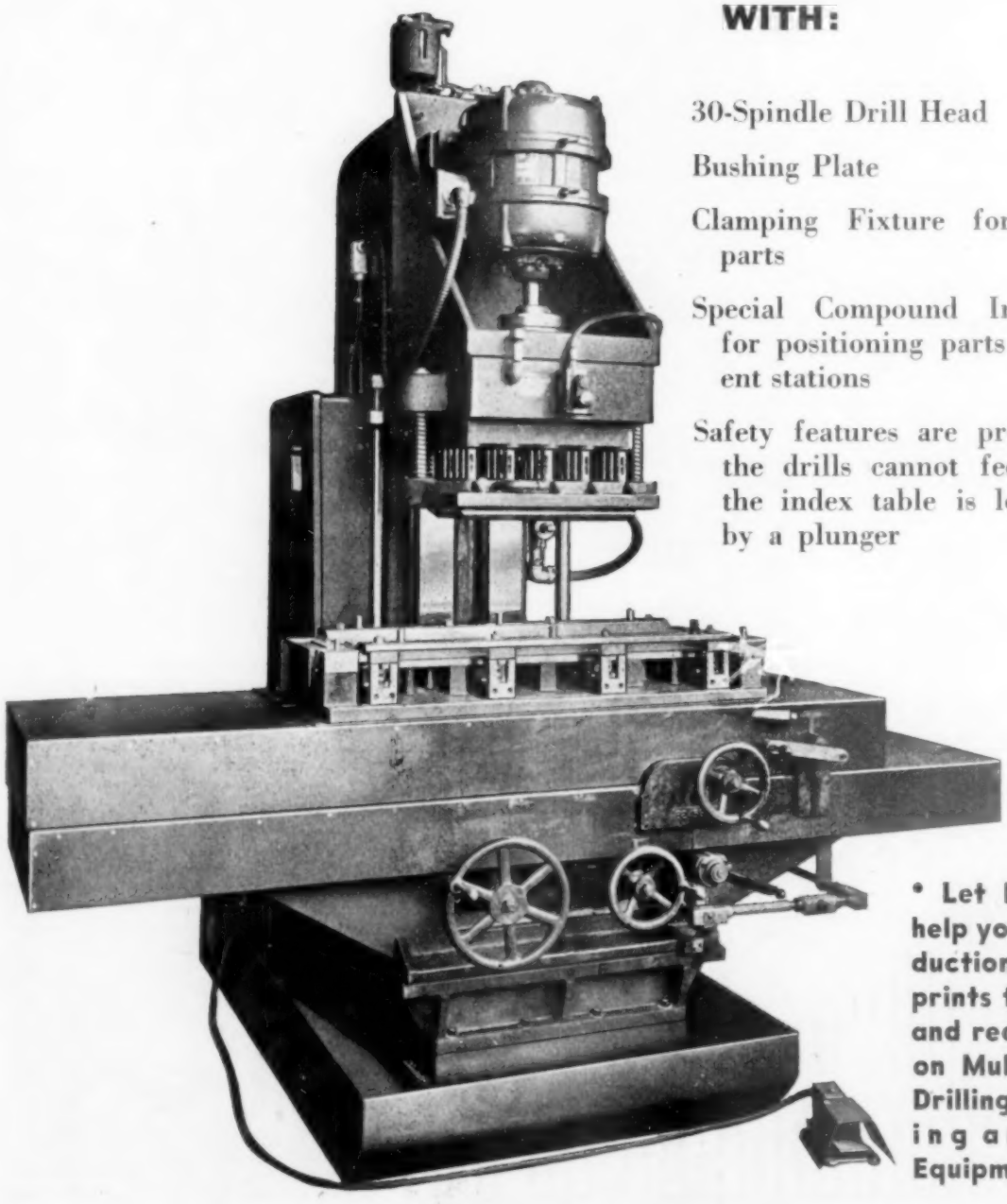
The most recent Government estimates of the number of surplus machines which will be declared surplus when World War Two ends range from 500,000 to 600,000 units.

THE END

79,000 HOLES AN HOUR—

1/4 IN. DIA. ON .302 CENTERS IN 10 ALUMINUM PLATES

Buhr TOOLS A STANDARD DRILL PRESS



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CAPITAL COMMUNIQUE

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

T. N. SANDIFER

Special dispatch from The Bramson Publishing Company's Correspondent in the nation's capital

WASHINGTON

As the dust settles from the uproar of November seventh, it looks very much like the same general pattern as before.

The "lame duck" session (85 retirements, including 47 by voters and the others not running) will sit only to December 10.

The major bills of interest to industry that were pending before the election recess probably will not get much attention until the new Congress meets January third. The advance outlook then is that the same general voting bloc—conservative Democrats with regular Republicans—will dominate the program. This might prove premature, but is the guess of well-informed onlookers.

INDUSTRIAL RE-DISTRIBUTION

A major battle is shaping over plans in Congress to push for a re-distribution of industrial production such as steel and various types of mass manufacturing. Pacific coast interests are making a strong bid to keep in operation the steel producing plants installed in that area.

Naturally Western Congressional elements are sympathetic to ideas which they see as leading to rapid industrialization of areas now said to possess large resources in metals, plant space, and markets. Small-business enthusiasts have shown much activity in this connection.

One of the early hearings scheduled by the Senate Small Business Committee, headed by Senator James E. Murray, of Montana, will concentrate on the development of a surplus machine tool disposal program that would help modernize thousands of small metal-working companies.

As a matter of fact, reports reaching Washington indicate that machine tool builders are rather counting on extensive modernization of the country's industries to pull them over the tough spot created by production for war. As to how much of this potential market they can expect, with the Government surplus in view, only time will tell.

The latest and first detailed report of the Surplus War Property Administrator points out that the major problem of machine tool disposal is still ahead. Most of the Government-owned machine tools are still in war use.

The report reveals, incidentally, that relatively few machine tools have as yet, been declared surplus. Up to August this year, out of 500,000 to 600,000 Government-owned tools, only 5,287 had been declared surplus, and 4,485 of these had been sold. When the war began, there were approximately 900,000 machine tools in the whole United States.

This indicates that available equipment is still heavily involved in war production. Other reports show that facilities for making machine tools also are deep in war work, not all of them making machines. One of the first reconversion jobs foreseen at WPB will be getting these tool-making plants back at their regular production in order to assure specialized machines for the plants returning to civilian production.

SURPLUS FINANCING POLICY

Meanwhile, to facilitate disposal of machine tools not needed by the Government, the pricing policy has been well-stabilized. Also, as an inducement to smaller plants, the Reconstruction Finance Corporation, which has general jurisdiction, has adopted a liberal credit policy. This permits sales on a 15 percent cash downpayment, the balance payable in monthly installments over a five-year period at four per cent interest.

There has also been submitted to the Surplus Property Administrator a plan for disposal of surplus cutting tools, although this has not been put in general operation. Large numbers of cutting tools are expected to become surplus with the rise in contract terminations, and are becoming so, now.

In recognition of the danger that such tools may be sold by inexpert agents, at great loss to the Government, the general aim of the plan is to provide for orderly sales, at fair returns, and in a fair ratio to new production.

The proposed plan will permit any cutting tool manufacturer to act as an agent of Defense Plant Corporation, the disposal organization for surplus cutting tools. Surplus tools will then be sent directly to the plant which manufactured them, as agent for the Corporation. There, the tools will be inspected, inventoried, stored, and put in first class condition at the expense of the DPC.

CUTTING TOOL DISPOSAL

Tools at these plants will then be categoried—standard, semi- special and cutting tools. The manufacturer will then sell the Government-owned tools on a percentage relation with the tools he manufactures himself. He will receive a specified commission on sales, which will be made through regular distribution channels.

The plan has to receive the benediction of the Attorney General, but otherwise has been favorably considered by the other interested agencies. If approved, it may be extended to abrasive wheels, ball and roller-bearings, as well as other equipment.

On the general subject of surplus sales, the Reconstruction Finance Cor-

(Concluded on following page)

RFC LISTS SURPLUS MACHINE TOOLS

WASHINGTON—With "For Sale" signs being hung on an increasing number of Government-owned machines tools, the Surplus War Property Division of the Reconstruction Finance Corporation has at last made available comprehensive data on the location, condition and price of such equipment.

RFC has announced a catalog listing more than 800 surplus machine tools now offered for sale by the Government. Copies may be obtained in any of the 23 regional offices of this Federal agency. The listing includes a brief description of the machines now for sale, and complete details on the formula by which prices on these surplus machines may be computed.

RFC's program for disposal of surplus machines calls for complete decentralization of the operation. Consequently, prospective buyers are asked to make inquiry regarding surplus equipment at their nearest RFC regional office. These offices are said to have complete data on all machines in their own territories, and will obtain information regarding machines held in any other RFC office.

In addition to information on machines already declared surplus, these regional offices are said to have lists of machines which are idle in war plants, but which have not yet been released by the contracting branch of the armed forces. Detailed information on this category of equipment also will be obtained by the regional offices, and the RFC will endeavor to secure a release for the equipment from the service sponsoring its use.

Locations of RFC regional offices handling surplus machine tool disposal: Atlanta, Ga.; Boston; Charlotte, N. C.; Chicago; Cleveland; Dallas; Denver; Detroit; Houston; Kansas City, Mo.; Los Angeles; Minneapolis; New Orleans; New York; Omaha; Philadelphia; Portland; Richmond, Va.; St. Louis; Salt Lake City; San Antonio, Tex.; San Francisco; and Seattle.

Many machine tools listed in RFC regional offices as 'available', but not 'surplus', are now being sold to the lessees now in possession of them. Such sales are subject to the condition that the machines be kept on war work "as long as may be necessary".

YOU CAN'T STRIP THREADS WITH THE
Won't Over-tighten · Saves
Screws, Nuts and Bolts ·
Standardizes Assembly
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—CAPITAL COMMUNIQUE—

(Concluded from preceding page)

poration has found it necessary to state that the mere announcement that a war plant may be offered for future lease or sale by the Government does not mean that war production is going to stop in that plant, or that workers are to be laid off immediately.

Recent distribution of a catalogue of plants marked for future release through sale or rental, by the RFC, was misinterpreted in some areas, with workers construing the announcement as tantamount to notice that they had better look for new jobs.

SCREW THREAD STANDARDS SOUGHT

In fact, says the RFC, only one Defense Plant Corporation plant has been offered for sale. This was necessary because the private operator wanted to buy it, and regulations require advertisement of such plants to secure a wide range of bidders. The advertisement stressed that the plant would remain in war production as long as needed. The private operator however, wanted to know how to plan for reconversion on a long-range basis.

The United States, England and Canada have at last gotten together on one problem that caused trouble during the early stages of the war—a uniform screw-thread. Back in the early 19th century, British industrialists adopted the Whitworth thread, with rounded top and bottom, while in this country, a thread with a flat top and bottom, and a 60° angle instead of the British 55° became standard. The schism has caused trouble since.

American manufacturers turning out British war materiel experienced great difficulty in producing the British screw thread, which involved not only costly tool setups, but tools which were difficult to obtain. The trouble has caused many delays in production of equipment for British and American use with interchangeable parts.

AUTOMOTIVE PROBLEM CITED

Army ordnance engineers developed a system of threads, having a flat-topped Whitworth form, designed so that components having these threads could be interchanged with those having the full-form British standard Whitworth thread. The idea worked so that it was applied to ordnance equipment, ammunition components, and other items manufactured in the United States.

Space does not permit description of the detailed arrangements finally worked out, but it now looks as though in future the pre-war trouble of a motorist in Britain driving an American car, and the American driver of a British car, may be eliminated if the compromise is retained. Canadian war contractors are reported to have been using a modified Whitworth form for some time previously in their own plants.

One of the major luxury British car manufacturers actually pioneered in a compromise screw thread of this type, having used it for 30 years. It is said the proposed arrangement covers threads for use in British and American airplane engines, as well as other mechanical units.

THE END

There are Many Reasons

WHY BROACHING LOWERS COST PER PIECE

★ LOWER WAGE RATE LABOR USED

★ OPERATIONS CAN BE ELIMINATED

★ FASTER PRODUCTION

★ LESS HANDLING

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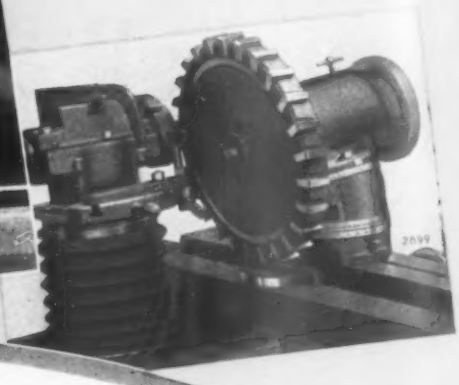
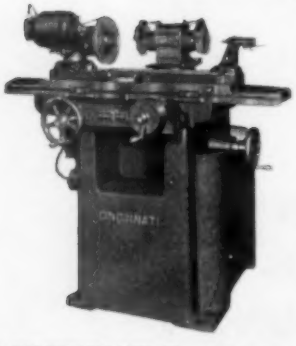
Left: Sharpening a pencil sharpener cutter. The technique employed here is to lock the table, and slide the cutter on an arbor held between the two tailstock centers.

Below: Grinding the face of the teeth of a 16" diameter face milling cutter, with the aid of the Face Mill Grinding Attachment.



You Can Sharpen Both of These Cutters on a CINCINNATI



● CINCINNATI No. 2 Cutter and Tool Grinder. Complete specifications may be obtained by writing for catalog M-962-2

CINCINNATI No. 2 Cutter and Tool Grinders have the capacity and versatility of adjustments for grinding a wide range of sizes and types of cutters. Two extremes are shown here. The pencil sharpener cutter demonstrates the convenience of the universal tooth rest; the face milling cutter and attachment demonstrates the capacity of the machine to support a heavy load, yet the table can be moved along its ways with a light push with one finger.

CINCINNATI

Principal specifications are listed in our general catalog M-995-2.

THE CINCINNATI MILLING MACHINE CO. CINCINNATI, 9 OHIO, U.S.A.

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INDUSTRIAL NEWS DIGEST

. . . a review of significant developments and new techniques in mass production industries . . .

Joint Commission Reports on Basic Screw Thread Standard

WASHINGTON—Reporting encouraging progress in its efforts, the Combined Production and Resources Board has revealed that a joint mission has been in London endeavoring to find a common standard for screw threads.

Screw threads has been an incalculable factor in hampering production of interchangeable parts during the war, the Anglo-American-Canadian board points out. The board cites the prewar difficulties encountered when British machinery broke down in the United States, or when American apparatus required repair in Britain.

Concerning the standards conference, CPRB said:

"The conference, arranged by the British Standards Institution, was attended by a joint mission from Canada and the United States, which was unique in being the first joint mission to be sent to the United Kingdom by the Combined Production and Resources Board.

"The visiting mission was led by Elmer J. Bryant, of the United States, chairman, and J. G. Morrow, of Canada, Vice Chairman. The British delegation was led by Stanley J. Harley, Chairman, and Percy Good, Vice Chairman.

"The need for a single basic standard for screw threads in common use in place of the two separate systems which are not at present interchangeable was examined. A number of specialized types of screw threads also came under review and considerable progress was made in the formulation of recommendations for common standards."

CPRB concluded its report with the announcement that design and drafting procedure, including limits and fits for plain dimensions was considered and it was agreed that the possibility of establishing a uniform practice for the three countries should be explored.

Details of the Screw Thread Mission report were revealed November 16, to engineers gathered in New York City. At the meeting, held under the joint auspices of the Society of Mechanical Engineers, American Standards Association, and the Society of Automotive Engineers.

W. L. Batt, WPB Vice Chairman, drummed home the importance of this work in commenting that "different standards in the United States and Britain have already added at least 100 million dollars to the cost of the war."

Meehanite Institute Officers Named at Annual Meeting

NEW YORK—Attracting 200 representatives of the member foundries of the Meehanite Research Institute of America, the 16th Annual Meeting of the technical and trade association was held here November 1 to 3.

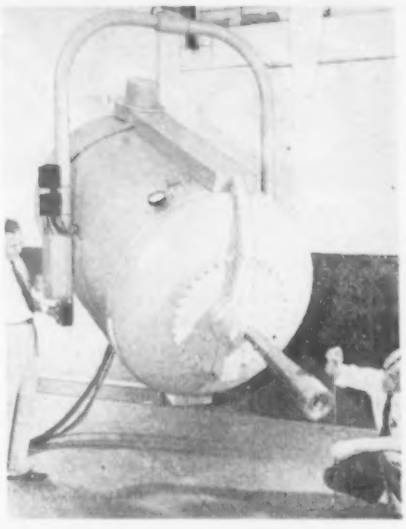
Oliver Smalley, Meehanite Metal Corporation, New Rochelle, New York was named association President for the 1944 term.

Other Institute officers elected were First Vice President, H. B. Hanley, American Laundry Machinery Company, Cleveland; Second Vice President, A. C. Denison, Fulton Foundry & Machine Company, Cleveland; and Secretary-Treasurer, C. S. Nichols, Meehanite Metal Corporation, Chattanooga, Tennessee.

Features of the program included the presentation and exchange of research information as developed by member foundries, and the study of service records of wartime applications of Meehanite Castings in India, Australia, Africa, Great Britain and South America, where similar Institutes are in existence.

(Continued on page 117)

X-RAY SPEEDS PRODUCTION



Dr. E. E. Charlton (left) and W. F. Westendorp check GE's giant metal inspection unit.

● X-ray pictures can be taken through steel 12" thick, using a new 2,000,000 volt mobile x-ray unit developed in General Electric's Research Laboratory.

Voltage of the new unit is double that now available for examination of metal sections. Up to now the most powerful X-ray unit in general use has been the GE 1,000,000-volt apparatus, more than 50 of which are in operation.

In radiographing an 8" steel casting the 2,000,000-volt outfit is 78 times as fast as the 1,000,000-volt unit, according to Dr. E. E. Charlton, in charge of the research development. For thicker sections, the ratio with the 2,000,000-volt unit is even greater.

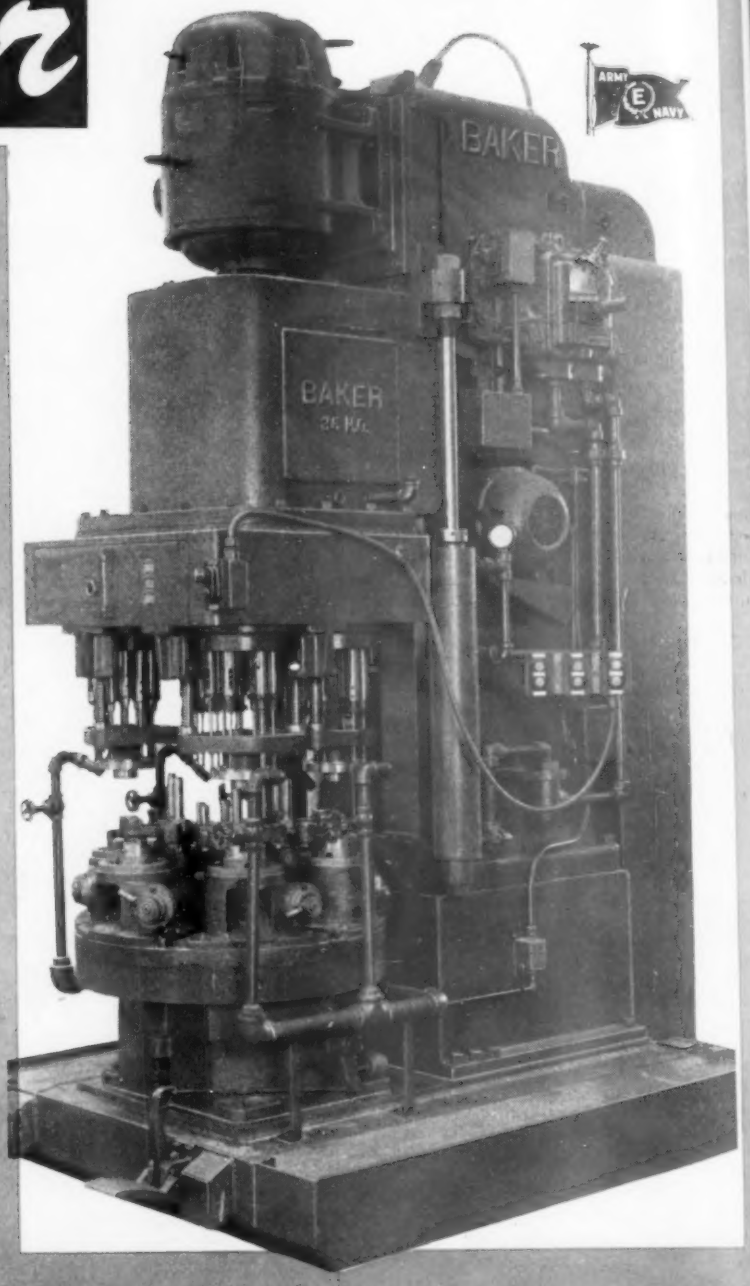
"GREENIE" *She's "Regusted"*

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

WHATSAMATTER, GREENIE? YOU LOOK SO PEEVED YOU COULD EAT THE CARBIDE TIP OFF A CUTTER!
SURE--FOR MANY LONG MONTHS I'VE WORN MY KNUCKLES TO THE BONE IN THIS GARDEN OF GRINDERS---AND NOW THAT NERVY HUSBAND OF MINE, GUS, WRITES FROM OVERSEAS THAT HE IS SPENDING ALL HIS TIME IN THE EUROPEAN THEATER!
RALPH DAVIS

Baker

Model 36-HO



ONE of the divisions of General Motors Corporation has made efficient use of this Baker machine on a high production job requiring multiple drilling, multiple rough and finish reaming holes in rear unit drums, made of mild steel.

The standard Model 36-HO unit was adapted to this set-up by equipping it with a 36-spindle fixed center multiple head with a six-station index table. This method permits loading and unloading the part while the machine is in operation, thereby greatly increasing production.

THESE ARE THE OPERATIONS HANDLED AT VARIOUS STATIONS:

- **STATION No. 1 —** Load and unload one part.
- **STATION No. 2 —** (12 spindles). Drill six holes .328" diameter. Drill six holes .390" diameter.
- **STATION No. 3 —** At this station the machine is arranged with 12 spindles, but only three are used to handle the part mentioned. In this instance the three spindles drill three holes through ¼" diameter. Additional spindles in the machine are available to handle a second part.
- **STATION No. 4 —** This is a blank station, provided to allow for wash out of chips.
- **STATION No. 5 —** (6 spindles). Rough ream six holes .343" diameter.
- **STATION No. 6—** (6 spindles). Finish ream six holes .369" diameter.

These operations are about 2" down in the chamber of the drum. Accordingly, the tools are supported on plates carried from the machine head and moving down into the chamber so as to give proper support near the start of cut.

★ Since the basic machine is a standard 36-HO, adaptable to different multiple heads for various operational arrangements, *flexibility* is a noteworthy feature. The cycle, which is fully automatic, is started by means of a push button station on the machine head, convenient to operator.

• Purchasers of this type of equipment have constantly insisted that the major parts should be readily accessible for easy servicing. Note that on machines of this model, Baker has placed the hydraulic oilgear pump and its control, and the driving motor, all out in the open. Hydraulic cylinders on all Bakers are conveniently located outside for taking up glands to prevent oil leakage.

Baker Brothers, Inc. Toledo 10, Ohio

MACHINES FOR DRILLING • BORING • TAPPING • CONTOUR GRINDING

(Continued from page 115)

Gray Iron Founders' Society Holds 16th Annual Meeting

CINCINNATI—Walter L. Seelbach, Secretary-Treasurer, Forest City Foundries Company, Cleveland, was re-elected President of the Gray Iron Founders' Society at the Association's 16th annual meeting and postwar planning conference here.

Widely known for his activities in the interests of the gray iron castings industry, Seelbach was one of the organizers of the trade group and served as its first president in 1928.

Also re-elected were H. L. Edinger, Vice President, and F. H. Rayfield, Secretary. Edinger is President of the Barnett Foundry & Machine Company, Irvington, N. J., and Rayfield is Vice President of Potter and Rayfield, Incorporated, Atlanta, Ga.

Homer Britton, Vice President of Cleveland Foundry Company, Cleveland, was chosen as a new Director and named Society Treasurer. W. W. Rose, of Washington, was reappointed Executive Vice President.

At the Concluding session, society members elected six new Directors to serve three years. They are: Homer Britton; George H. Alten, President, Alten's Foundry and Machine Works, Lancaster, Ohio; Max Kuniansky, Vice President, Lynchburg Foundry Company, Lynchburg, Va.; S. D. Russel, President, Phoenix Iron Works, Oakland, Calif.; Howard A. Stockwell, Treasurer, Barbour Stockwell Company, Cambridge, Mass.; and Lawrence F. Williams, Assistant Secretary, Cooper-Bessemer Corporation, Grove City, Pa.

Machine Shop Workers Taught Electronics in Plant School

ELMIRA, N. Y.—Recognizing the development of a new science in mass production industry, the Eclipse Machine Division of Bendix Aviation Corporation is conducting weekly classes in introductory electronics for both day and night factory shifts.

The company, which pioneered mass manufacture of mechanical time fuses and 20 millimeter automatic aircraft cannon, has introduced electronic devices in several revolutionary manufacturing and inspection processes.

"We are not attempting to teach grinders, inspectors and machinists the science of electronics," explained T. K. Riggen, electronics engineer, who conducts the course, "or turn laymen into electronic engineers. However, these workers find it necessary to understand the language of electronics in order to operate and maintain the new equipment we have introduced to speed war production.

"Industrial electronics—as applied here during wartime to precision instrumentation for inspection of time fuses, will be likewise applicable to precision automotive equipment production processes during peacetime," Riggen stated.

Enrolled for the first "semester" are employees from nine manufacturing departments, including the fuze assembly section where testing by "light-beam" dynamic regulators was first introduced.

Foundrymen Select Detroit as Scene of 1945 Congress

CHICAGO — Detroit will this year play host to the 49th Annual Meeting of the American Foundrymen's Association and 1945 Foundry Congress. Meeting dates are April 30 to May 4. Even though V-E Day may precede the 4th War Production Foundry Congress, the Association's technical program is designed to stress the necessity of continued high production.

Program plans include the presentation of technical papers by outstanding metallurgists and operating men of automotive industries centered in the Detroit area. In tonnage of castings produced, Detroit has become one of the greatest foundry centers in the country and the availability of many plants for inspection trips by visiting foundrymen is expected to add interest to the meeting.

Each branch of the castings industry will be represented in the technical program, with major emphasis placed

(Continued on following page)

• Here is another in this magazine's series on the postwar outlook in metal-working, this month by a prominent manufacturer of precision tools.

PRECISION IN POSTWAR MANUFACTURE

J. A. HARRINGTON
PRESIDENT
SAVAGE TOOL COMPANY

"the demand for precision gaging equipment will tend to increase"

WITH our increasing knowledge of the important part that dimensional and finish control play in the economy of production, the demand for precision gaging equipment will increase after the war. The producer who does not follow this trend will not be able to compete in high production.

The need for precision-built machine tools has been greatly emphasized during the war. Most of the production lines of the postwar period will be equipped with single purpose machines which will not only produce at a high rate, but will enable manufacturers to offer products which have the close tolerances and fine finishes that have proved so efficient in wartime.

American industry has always been prompt to utilize the experiences gained during periods of stress. Evidence of this was shown immediately following World War One, when industry, having learned the economies and efficiencies that could be gained through more precisely built munitions, adopted the methods used in their manufacture for peacetime products.

A few years ago, an airplane engine was built to tolerances of one or two thousandths of an inch, and surface finish was left largely to the operator making the part. As a result, the engine would last about 100 operating hours before requiring overhaul.

Today, this same engine, built of substantially the same materials but with tolerances of ten-thousandths of an inch and finishes specified and held to fixed micro-inches, serves for 500 combat hours before overhaul. The fact that these parts have been held to close dimensions not only effects economy in their operation, but also simplifies assembly.

In order to compete in the postwar period, the producer will place emphasis on control of quality in his product. In order to control the quality, he first must measure it; and since his only standard of measurement is the gage block, it is the foundation upon which he will build his inspection and quality control. Use of the gage block insures interchangeability of his product.

With the modern methods by which records are kept of all gages and fixtures, and with mobile inspection units in his shop, he has at all times the necessary control to insure product quality. He thereby eliminates expensive runs of parts which are not up to specification and generally are scrapped because they will not fit at the assembly line.

THERE'S A SPOT IN EVERY METAL-WORKING PLANT

for a Wells No. 8

SPECIFICATIONS
WELLS No. 8

CAPACITY: Rectangular 8"x16"
(Special Guides) 5" x 24"
ROUNDS: . . . 8" diameter
MOTOR: . ½ H. P., current optional
SPEEDS: . Selective 60, 90, 130 feet per minute
WEIGHT: . . . . Approximately 750 pounds

• The Wells No. 8 Metal Cutting Band Saw doesn't need much floor space. Every plant has a spot for one—and what a *busy* spot that becomes—for a Wells is a machine that always finds plenty of work. You can use it for all the odd cutting jobs and free large production units. And you will find it accurate, efficient and economical on certain production runs too.

The Wells will cut most any shape, size or type metal you can get into it . . . quickly and with a minimum of labor. What's more, one of the Wells' best features is that it can easily be moved to any job to save the time and labor of bringing the work to the saw.

You'll be wise to mark an X on the spot in *your* shop where you intend to put a handy Wells to work cutting metal economically and efficiently.

Wells SAWS
Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
1212 MONROE ST., THREE RIVERS, MICHIGAN

(Continued from preceding page)

on non-destructive testing methods, sand practice and melting operations. A feature will be the presentation of the 3rd A. F. A. Foundation Lecture, to be presented by Dr. H. A. Schwartz, Manager of Research, National Malleable and Steel Castings Company, Cleveland. Lecture subject will be "Solidification of Cast Metals."

Selection of the Motor Capital as scene of the Foundrymen's meeting was made following an invitation of the Association's Detroit Chapter, of which R. G. McElwee, Vanadium Corporation of America, is Chairman.

No exhibit is planned in connection with the Detroit meeting, as industry plans are said to be concentrated on the 50th Anniversary Foundry Congress and Foundry Show of the Association, to be held in 1946.

Advantages Cited for New Oxy-Acetylene Pressure Welding

NEW YORK — Materials previously welded with difficulty may now be joined easier and more satisfactorily through the use of oxy-acetylene pressure welding, according to Dr. A. B. Kinzel, Vice President, Electro Metallurgical Company and chief metallurgist of Union Carbide and Carbon Research Laboratories.

Speaking before the American Society of Mechanical Engineers, Dr. Kinzel stated that added advantages of this method are smoothness and uniformity of weld, short welding time, and relatively low unit cost.

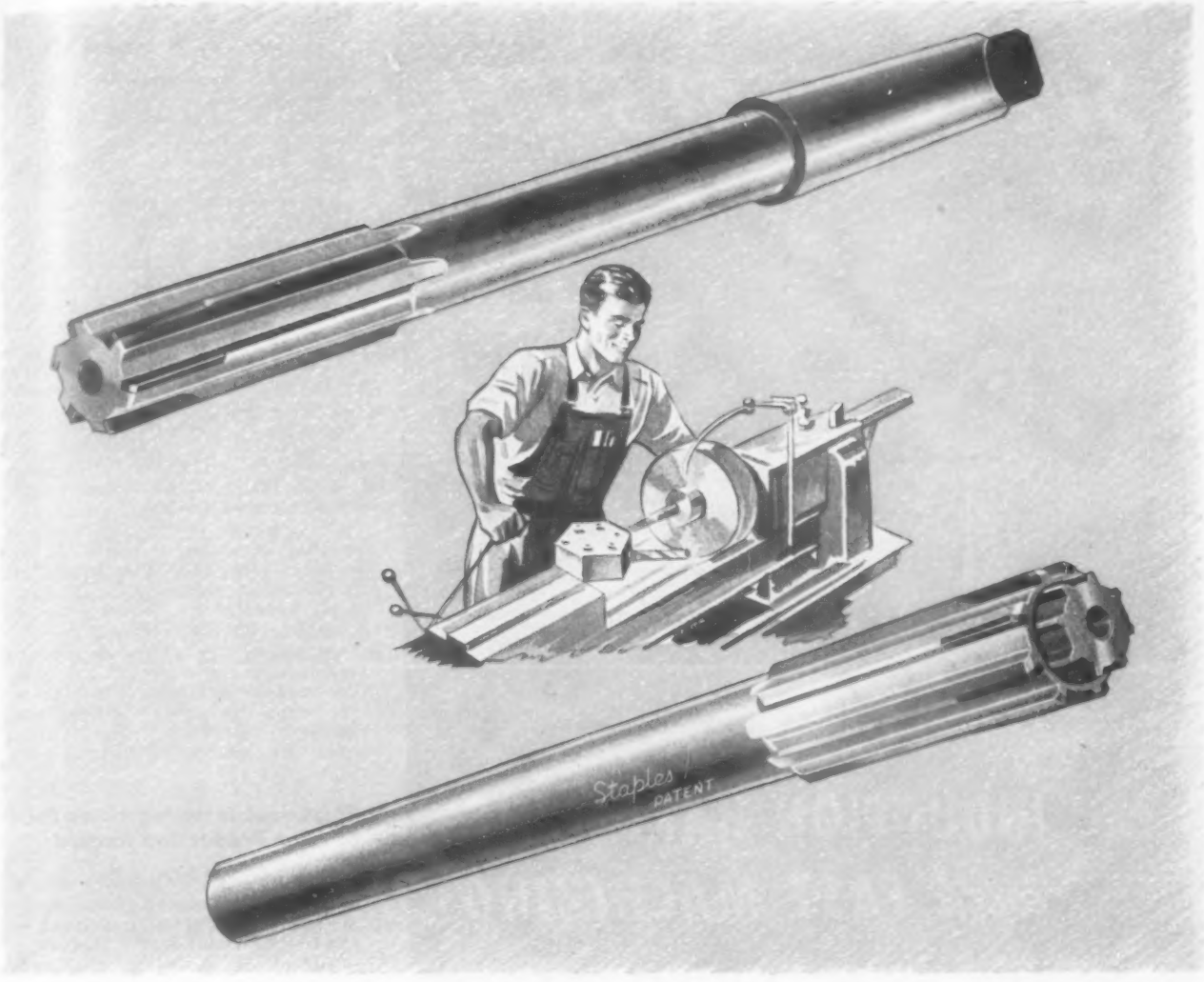
"In this process, which may be fully or partly mechanized," Dr. Kinzel said, "the specimens are butted under nominal pressure, heated by means of multiple small oxy-acetylene flames to a temperature of about 1200° C. and upset to a controlled degree.

"The process possesses many special advantages over currently used mechanized welding methods among which are: adaptability to those high-carbon and alloy steels that are welded with difficulty by fusion welding methods; smoothness and uniformity of the completed weld; short welding time and relatively low unit cost. The physical properties of these pressure welds are excellent."

Dr. Kinzel said the process is now being used on railroad rails, overland pipes up to 24" diameter, oil well tool joints, small liquefied gas tanks, boiler tubes and many other commercial welding operations.

"More technically" he explained, "oxy-acetylene pressure welding is known as 'solid phase welding' because it is a method of joining two structural members in which none of the material is melted, or brought to the liquid phase, at any time during the welding process. On this basis oxy-acetylene pressure-welding may be defined as a process by which 'structural members are bonded by atomic forces without the presence of a liquid phase at any stage of the process, comprising pressing together clean, smooth surfaces so as substantially to exclude air, and maintaining

(Continued on page 120)



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REDUCE YOUR HOLE COSTS

Staples' first—and still its major—customers were the makers of aircraft engines. For these manufacturers found that even their exacting standards are not too rigorous for Staples cutting tools to meet.

Now, due to our expanded facilities, the superior design and precision of Staples tools, backed by years of acceptance by the aircraft engine industry, are available to you.

With Staples reamers, spot facers, counterbores and other Carboloy-tipped circular cutting tools, faster and more accurate machining increases your man-hour output, reduces your cost per hole.

Standard tools are available from stock. We also solicit your inquiry on special tools designed to meet your special needs.

Staples Tool & Engineering Company
Cincinnati 25, ... Ohio

Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS • SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS

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COLD FINISHED .45+ CARBON OPEN HEARTH

SPEED TREAT STEEL

for FLAME *or*
INDUCTION HARDENING
with FAST MACHINING

USE SPEED TREAT STEEL

You will obtain hardness of 60 to 62 Rc. with water quench and of 56 to 58 Rc. with oil quench from flame or induction hardening of SPEED TREAT STEEL . . . and it machines consistently at 170 S.F.P.M.

Scores of users' plant records prove production increases of 35 to 55% — doubled tool life — elimination of breakage — scrap reductions of 50 to 75% — no warpage — and superior finishes.

SPEED TREAT ECONOMICALLY REPLACES C1043-C1046-C1137 and C1144. *USE SPEED TREAT STEEL!*

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MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

(Continued from page 118)

suitable pressure while heating to effect bonding.'

"As a result of experimentation, it has been found that the bonding mechanism or method by which a sound, strong weld is obtained without the melting and fusion usually associated with the function of a weld comprises atom transfer across the interface (contacting surfaces of abutting members) in accordance with the laws of diffusion with a resultant trans-interface crystallization.

Temperature is found to be the dominant factor in the practical application of solid phase welding. A temperature of 1050° C. appears to be the feasible minimum for steel, with a maximum of about 1200° C. well below the melting point of the lowest melting constituent of the metal.

"Successful experiments with the welding of austenitic steels and various brasses have been made," the metallurgist explained. "Numerous tests have led to the conclusion that complete interface elimination as determined by the microscope is the best scientific criterion of the quality of a pressure weld, although such physical properties as yield strength, tensile strength, elongation, and reduction of area are well-suited to engineering purposes."

Electrical Manufacturers Point to War Production Record

PITTSBURGH — Winning the war will be the paramount objective of the electrical manufacturing industry until the last "V-Day", A. C. Streamer, new president of the National Electrical Manufacturers Association, has declared.

NEMA, representing all phases of the electrical manufacturing business, has a membership of 444 producers of equipment in the United States.

The Association executive, who also is Vice President of Westinghouse, sounded a note of caution against over-optimism concerning the war's end, saying, "Undoubtedly the demands of the Army and Navy, even with the bright prospects in Europe, mean that for many months practically the full resources of the industry will be devoted to this purpose.

"The electrical manufacturing industry can take honest pride in its wartime performance," Streamer declared. "In 1943, the last year for which complete records are available, it exceeded the previous year's production by 33 per cent, which in turn was 50 per cent over 1941, which was double that of 1940.

"That 33 per cent increase last year, probably the most vital production period of the war, can be contrasted with the increase in production of 20 per cent for all industries."

To keep up with this "war of instruments", Streamer pointed out that the nation's annual production of meters and other electrical measuring and indicating devices went from 700,000 to 28,000,000 units in three years.

(Continued on page 122)

SPECIFY SUPER CARBIDE TIPPED REAMERS

. . . AND GET IMMEDIATE DELIVERY FROM STOCK!

Super reamers are supplied with hardened flutes—eliminating the possibility of them picking up chips and scratching finished surfaces. Shanks are tough rather than hard, so they will hold well in chuck or sleeve and present maximum resistance to breakage.

Specify "Super" and you are assured of Super Satisfaction.

★SOLID CHUCKING REAMERS.
Stocked in both straight and Taper Shank, in sizes from ⅛" to 1½" diameter. Also stocked semi-finished for quick completion to special size or tolerance.

★JOBBERS TYPE REAMERS.
Stocked in Taper Shank only in popular sizes from ¼" to 1½" diameter.

★EXPANSION REAMERS.
Made with straight or Taper Shanks, stocked in all popular sizes from ½" to 1½" diameter.

★STUB SCREW MACHINE REAMERS.
Stocked in semi-finished condition for quick completion to specified size from ¼" to ¾" diameter.

★SHELL REAMERS.
Standard design. Not stocked. Supplied in all required sizes promptly.

WRITE TODAY FOR THIS LITERATURE

Descriptions, illustrations, prices and complete details of Super Carbide Tipped Tools for turning, facing, reaming, spot-facing, forming, grinder rests, wear parts, boring, drilling, grooving, counterboring, shaving, centers and special purposes are given in a series of folders. One or all of these folders will be sent to you upon request. Write today.

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.

Season's Greetings

With War's end approaching and the blessings of Peace soon to be ours again, the coming Holiday season promises added joy and happiness for all of us.

To our customers and friends, we take this opportunity to extend our sincere Holiday Greetings with the earnest wish that they may enjoy a full measure of the season's gladness..made richer by realization of the assured victory which we have all fought and worked for so earnestly and unselfishly.

THE WELDON TOOL CO. Cleveland 4, Ohio

3000 WOODHILL ROAD

INDUSTRIAL NEWS DIGEST

(Continued from page 120)

Gear Manufacturers Foresee Higher Postwar Standards

CHICAGO—Highlighted by an exceptionally optimistic postwar business outlook the Semi-Annual meeting of the American Gear Manufacturers' Association was held here October 30—November 1.

Three hundred members in attendance heard that the industry today is operating at approximately 400 per cent of its normal peacetime volume. Despite the fact that it faces a cut of at least 50 per cent in output at the end of the war, it was reported that every indication exists that postwar production will be twice the pre-war normal.

As a result of wartime developments, it was reported in technical papers, refinements in accuracy, finish and rate of output will radically change the character of the industry when peacetime manufacture is resumed.

Don't look for a letdown in the standard now required, members were warned. Louis R. Botsai, President of the AGMA, pointed out that peacetime consumers of gearing equipment will demand standards as exacting as those required on war work.

Outstanding technical development discussed at the meeting was a report by the Navy Department on gear production work using cemented carbide hobs in marine gear cutting.

Contingent on travel conditions, it was announced, the AGMA Annual Meeting will be held at Hot Springs, Virginia, May 21-23, 1945.

Civilian Production Authorizations Near $300,000,000 Mark

WASHINGTON—New civilian production through 1945 authorized under WPB's "spot" authorization plan reached a total of $291,000,000 by mid-November.

With 450 applications being received weekly, a total of 1,914 have been approved by WPB field offices, as against 464 denials.

Critical manpower rather than insufficient materials is still the major deterrent to reconversion, it is said.

INDUSTRIAL BUSINESS NOTES

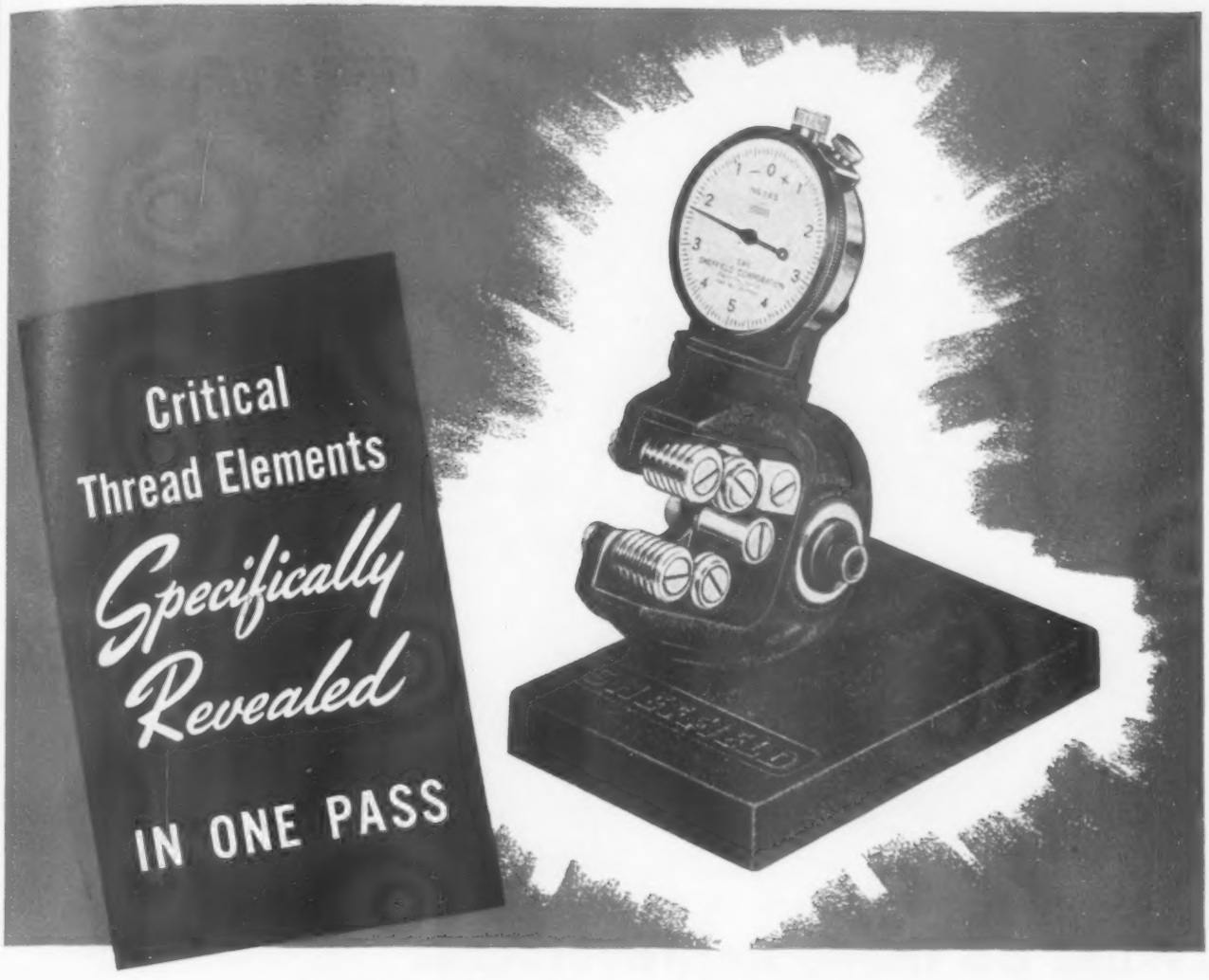
News of Industry Expansions, Services, and Activities

Foundation: Assets of Stokes Industries have been acquired by the Winfield Baird Foundation of New York, according to Edward E. Stokes, former President. Stokes Industries was formerly the Sebastian Lathe Company. The plant is located at Covington, Kentucky. Baird Foundation devotes all its income to charity, being particularly interested in handicapped and under-privileged children. Stokes policies will be continued.

* * *

Magnesium: Magnesium fabricators look for no governmental feather beds to cushion their conversion, but expect to leave the public payroll after the war.

(Continued on page 125)



The Sheffield **THREDCHEK** provides a more *specific* and *accurate* check of critical thread elements than the conventional *collective* check.

Two GO rolls serve to pass parts that are not oversize and which *will* assemble. These rolls screen out parts which are oversize or which will not assemble because of an excessive error or combination of such errors in lead, angle and pitch diameter.

As the parts are passed from the GO or assembly rolls and are presented to the two NOT GO rolls, one of which is mounted so as to actuate a dial indicator, the dial shows whether the pitch diameter is too small and *by how much*. Should the pitch diameter show as being within tolerance limits and near basic, then it can be assumed that lead and angle are not only within tolerance limits but are also of the highest dimensional quality.

A free-rotating backstop enables the part to be properly located for accurate checking and also permits checking for out-of-round. The backstop, together with the indicator, eliminates the need for a trained sense of "feel" in making the NOT GO check—a most important advantage of the THREDCHEK.

Both sets of rolls are PRECISIONPLATE—Sheffield precision chrome plate—for longer life. Full manufacturing tolerances may be utilized because wear allowance is compensated by adjusting the rolls on their eccentric axis. The open end style permits checking close to a shoulder.

THREDCHEKS are available in frame sizes corresponding closely to Sheffield Thread Roll-Snap Gages, with standard or special pitch rolls. *Write for engineering data "Instruments #8".*

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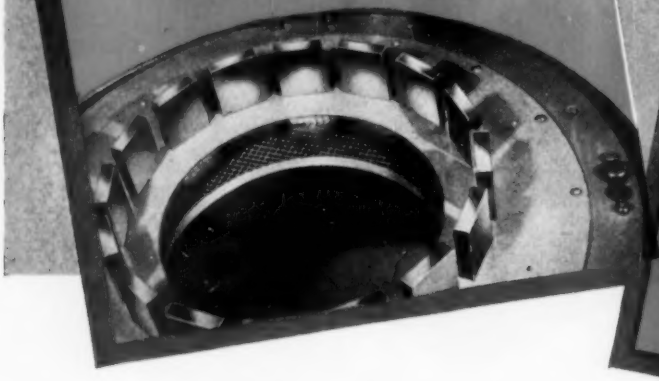
NOT ONE—BUT TWO

major developments *in gage block manufacture*

1 FONDA "ULTRA-FINISH"

produces gaging surfaces that are practically free from "peaks"!



2 FONDA-developed STABILIZING PROCESS

eliminates gage block growth or shrinkage (at 68° F.), up to 10 years in the aging test...which is considered permanent stabilization.

What do these improvements mean to you?

These FONDA *"Ultra-Finish"* gage blocks are processed to such extreme surface smoothness and accuracy that they require no oil or other film for wringing. No peaks to wear off and reduce block size . . . no films between stacked blocks to introduce other errors. Faster wringing! Longer wear! And safer, surer protection for your production accuracy standards.

It means that you can obtain—at no premium on price—the same fine-precision FONDA gage blocks such as are used constantly by the National Bureau of Standards and leading laboratories, for *sustained high accuracy* in critical measurements.

Prompt Deliveries

FONDA GAGE COMPANY
STAMFORD, CONNECTICUT

Agents in All Principal Cities throughout the World

PASSED HIGHEST TESTS DEVISED BY THE NATIONAL BUREAU OF STANDARDS

For a helpful summary of new modern developments in gage block manufacture, write for BULLETIN T.

44

FONDA *Gage Blocks*

ALSO FONDA PRECISION GAGES: Dial, Plug, Ring, Snap, Profile, Flush Pin, etcetera . . . all types except Thread gages.

(Continued from page 122)

according to Dr. Willard H. Dow, Dow Chemical Company President, who keynoted the initial convention of The Magnesium Association in New York City. Conventioneers learned that American magnesium men have little to learn from Germany and are anxious to learn if they can survive in private business. Significant statement: "magnesium holds within itself a greater power to increase wages while at the same time decreasing costs than do all the laws and all the politicians on earth." Real wages are made by science. Laws are only temporary buttresses.

* * *

Tung Tip: Grayson Manufacturing Company will change the firm name to Tung Tip Tools, Division of Lowell & Grayson, according to announcement of J. H. Grayson. The change was felt needed because of the similiarity of "Grayson Manufacturing Company" and "Grayson Heat Control Ltd.", the announcement said.

* * *

Engineers: W. C. Nichols and Joseph Palma, Jr., announce organization of Product Designers, Chicago, a firm of designers and engineers. The new company is a division of Johnson Fare Box Company, but will operate independently.

* * *

Optimistic: Packard Electric Division, General Motors Corporation, Warren, Ohio, views the peace optimistically—$2,500,000 worth. That figure set for postwar expansion, expected to boost the division's employment level 91 per cent above prewar and 35 per cent above present war level. B. N. MacGregor, General Manager, was authority for the announcement. Dead set on completing war contracts, the division is just as determined to minimize conversion time lag. They look to demands for motors, cable and wire harnesses.

* * *

Sandpaper: Behr-Manning Corporation, Norton Company Division, is currently stressing importance of plant surveys in connection with use of coated abrasives. The firm believes this approach, born of war necessity, should be followed in conversion. They base some of their material on reaction of plant visitors who admit they didn't know there was so much to know about sandpaper. There is a particular coated abrasive indicated for each use, and Behr-Manning is cautioning customers to find out the most advantageous material for each process.

* * *

Customer: War-destroyed Russian cities will obtain power from American-built turbo-generators. Joshua Hendy Iron Works, Sunnyvale, Calif., has accepted an order for 30 units, 10 of which will deliver 2000 kilowatts each, the rest rated at 500 kilowatts.

* * *

Purchase: Acquisition of rights, title and interest in D & W magnetic chucks and J & H demagnetizers is announced by Taft-Peirce Manufacturing Company, Woonsocket, R. I. The tools were formerly controlled by J. & H. Electric Company, Providence, R. I.

(Continued on following page)

When you change over to civilian products—here's how EUREKA Tool and Die Welding Electrodes will help you save time, material and avoid production delays.

1. You can repair existing die units to keep them in operation with a minimum of "down-time".
2. Changes can be made during die "try-out" periods by correcting design, rectifying errors, etc.
3. During die "change-over" contours, corners and edges of your old dies can be welded to adapt them to change in design.
4. Die units can be compositely fabricated by welding with desired tool steel electrodes, on mild or medium carbon steel, to form cutting edges or working areas.

Space does not permit detailed information here—so write us today for descriptive literature.

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Welding Equipment & Supply Co.

PIONEERS IN TOOL AND DIE WELDING ELECTRODES

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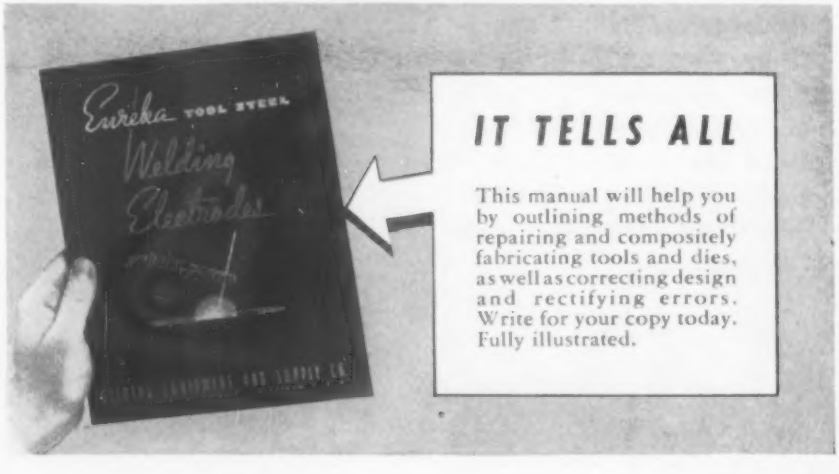

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Designed for multiple operations on a multiplicity of parts—(clamping six parts at a time)—parts with identical operation at 180°—(index fixture on index table)—drilling, reaming, and tapping.

Accelerated production by multiple fixturing—free loading or indexing while machine is in operation, multiple operations in time required for longest single operation.

METHOD No. 7—Higher production, lower cost per piece, duplicate operations on opposite side of work performed at one clamping—high quailty work obtained speedily, efficiently with minimum of supervision.

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Avey DRILLING MACHINES

INDUSTRIAL NEWS DIGEST

(Continued from preceding page)

Taft-Peirce will incorporate the new lines into their own Superpower group.

* * *

Laboratory: Sprawling E. I. du Pont de Nemours & Company will spill over into Akron, Ohio, with a laboratory to furnish technical service for rubber manufacturers, according to Harry A. Hoffman.

* * *

Representative: Boston-located Rudel Machinery Company becomes New England representative for Logansport Machine Company of Logansport, Indiana. Rudel is also outlet in the New York and Canadian territories.

* * *

Oldtimers: 1000 years service by 511 Indiana Standard Oil employees is noted by presentation of service pins to employees with 10 years service and up. Awards were during last half of 1944.

* * *

Acquisition: Pointing for early 1945 deliveries early, Sheldon Machine Company, Inc., Chicago, is transferring manufacture of the Vernon machine tool line from Los Angeles to Chicago. Sheldon has acquired the Vernon line, which includes horizontal milling machines, vertical milling machines and jig borers, back geared shapers and tool and cutter grinders.

* * *

Confidence: Upping postwar employment estimates to 20 per cent above peacetime levels, American Can Company eyes the future with confidence. D. W. Figgis, president, sounded the optimistic note after a three-day conference with company executives. The firm operates 67 factories.

* * *

Transition: With justifiable smugness America's bearing industry views with calm the reconversion period. President H. O. K. Meister, Anti-Friction Bearing Manufacturers Association, points out that wartime bearings are also peacetime bearings. Even women workers raise no problem, since bearing makers have always used women extensively.

* * *

Expansion: Augmenting the mechanical goods division, United States Rubber Company has agreed to purchase the L. H. Gilmer Company of Philadelphia, v-belt makers. President Herbert E. Smith reported.

* * *

Cooperation: Enterprise Food Machinery Corporation, Riverside, Calif., has built an office building over a canal which provides an air cooling medium.

* * *

Agency: Luther and Pederson Agency, Chicago, recently organized, will represent Davis & Thompson Company, machine tool builders.

* * *

Control: From cast iron cannon balls for the War of 1812, Hunt-Spiller Manufacturing Corporation, South Boston, becomes a part of the A. S. Campbell Company, Inc., Detroit and Boston. Manufacture will continue under the Hunt-Spiller name. Campbell is normally an automotive accessory maker.

(Concluded on page 128)

HE CINCINNATI SHAPER CO.

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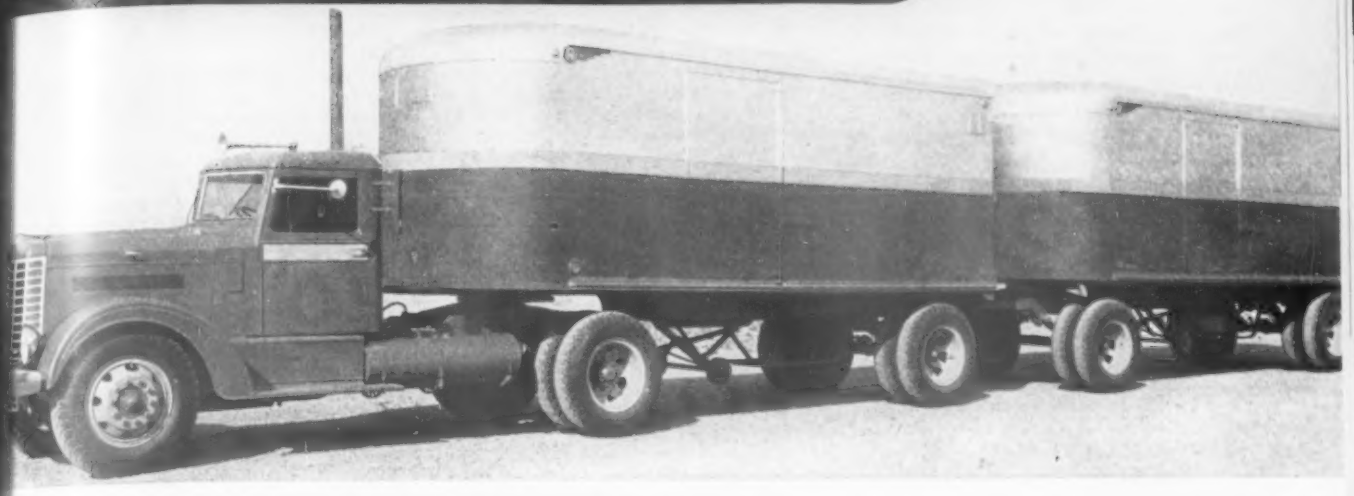
SHAPERS · SHEARS · BRAKES



TWIN EFFICIENCY

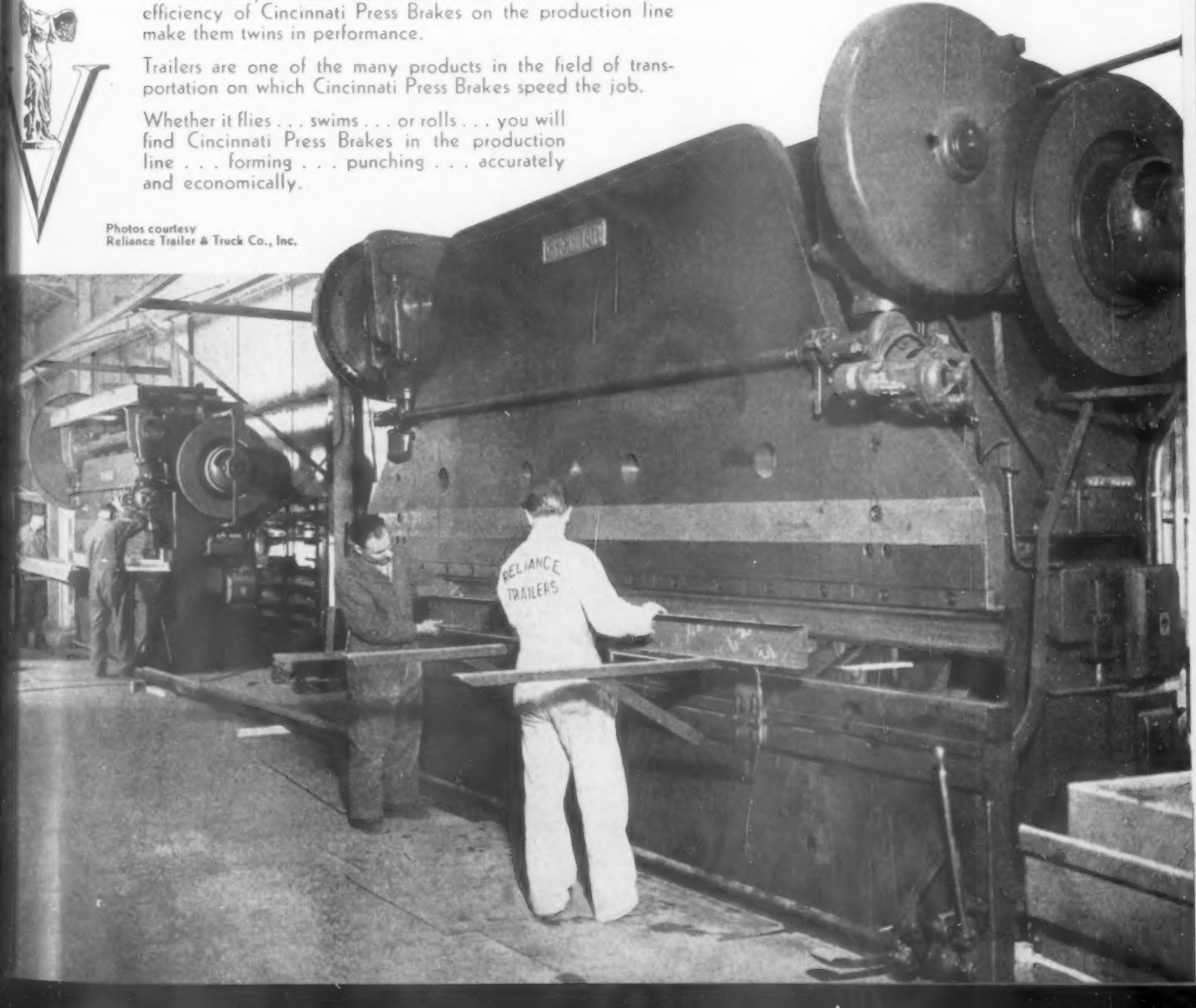
The efficiency of these Reliance Trailers on the road and the efficiency of Cincinnati Press Brakes on the production line make them twins in performance.

Trailers are one of the many products in the field of transportation on which Cincinnati Press Brakes speed the job.

Whether it flies . . . swims . . . or rolls . . . you will find Cincinnati Press Brakes in the production line . . . forming . . . punching . . . accurately and economically.

Write for Catalog B-2, a booklet illustrating and describing Cincinnati Press Brake applications.

Photos courtesy
Reliance Trailer & Truck Co., Inc.



(Concluded from page 126)

MOTOR MEMOS

Automen and WPB get closer together on reconversion problems, but big war orders are reminder that victory is not yet won.

Automotive Council to Continue Tooling Information Service

DETROIT — Although jam-packed with war work and behind schedule on heavy trucks and its portion of the ammunition and artillery program, the auto industry is nonetheless conscious as ever of "V-E Day" implications.

November's hint that the European war might collapse, with consequent overnight cancellations of war contracts, startled Government officials into full realization of the reconversion problems facing motor manufacturers. As a result, general understanding has been reached by the industry and WPB on overall reconversion procedure.

WPB is now reconciled to permit any and all leadtime work necessary to prepare for resumption of auto manufacture, when such work does not infere with production of critical war materiel. A program is underway to plan individual plant clearance of Government-owned machines and surplus materials. Plans for such clearance and disposal, along with other "V-E Day" functions, will be shelved after completion, ready for instant use.

Only fly in the ointment at this stage is the muddled machine tool situation. Most of the major producers are badly in need of certain machines to complete their first production lines. WPB is giving lip service to procurement, auto men point out, but is keeping the machine tool builders smothered with "foreign" orders and regulations.

The total number of machines is substantial that several of the major producers must have before even limited passenger car output can be resumed. In the cases of both Chrysler and General Motors, certain units on which no delivery date has been promised by machine tool builders, are absolutely necessary to the resumption of auto manufacture (see PRODUCTION Round-Table, page 104).

GM's ace machine tool man, as well as Plymouth's master mechanic, have been riding the rails for several months, trying to secure delivery dates from individual builders. Their efforts have been largely ineffective, and not because the machine tool builders are uncooperative. WPB is simply playing two games simultaneously, it is intimated.

What has much of the auto industry concerned is the unworried attitude at Dearborn, where Ford production men make no bones about the fact that they lost very few critical machine tools during the war. One of the pioneer motor maker's top production men recently told this department that Ford could commence very good auto output "tomorrow" with the machine tools the company now has available in its plants.

The machine tool phase of the auto industry's reconversion plans cannot be over-emphasized. Plants can be cleared, products designed, and production planned, but with a few machines missing, profitable, high production can never be started. One machine missing in a sequence of operation nullifies an entire production setup.

The automobile industry, acting through its Automotive War Production Council, has used various approaches in its efforts to swing public opinion and secure Government approval for its reconversion plans. Last month, the Council was forced by WPB to scuttle the publicity line that drastic cutbacks made imperative immediate action.

To support its contention that the end of the war is not yet in sight, the regional office of WPB here has revealed that during September and October a total of $298,884,094 in facility and supply contracts were let in the Detroit area alone. While $176,017,074 in war orders were placed here during October, WPB emphasized the fact that an additional $12,067,320 in new plant and production facilities was authorized during the month. The agency pointed out that no contract revisions had been received here since November 1, and that new contracts placed within the area far outstripped any cutbacks, contract terminations or cancellations in recent weeks.

Pressure on heavy trucks, ammunition and artillery is expected to push output of these war materiels to peak levels within 90 days. The industry's biggest war production worry is heavy truck output for the Army, now 60 per cent behind schedule.

One of the most interesting stories in the wartime history of this highly competitive industry is the universal spirit of mutual assistance and cooperation on war tooling and technological production problems. Acting through the Automotive Council for War Production—wartime version of the Automobile Manufacturers Association—auto builders, parts suppliers and its satellite tool and die industry, joined in exchanging technical know-how, metal-cutting equipment and knowledge of available production facilities.

News that the Automotive Council's Tooling Information Service, mechanism for exchanging war production know-how, would be maintained during the critical reconversion period was announced recently. This industry-wide service, it is generally agreed, will greatly accelerate the procurement of the tools, dies, jigs, fixtures, gages and similar equipment needed for passenger car production.

Compilation of information weekly regarding the available tooling capacity of more than 200 tool and die shops makes it possible for the Council's Tooling Information Service to put tool buyers immediately in touch with shops having facilities available to handle various types of work.

This program proved so effective in getting the automotive industry tooled-up speedily during the conversion period that the scope of the Tooling Information Service was expanded at the request of the military services and the coverage was made nation-wide.

The service has assisted scores of other metal-working industries to get their tooling requirements weeks ahead of schedule. A recent example of its effectiveness was a call from an Atlanta, Georgia, sheet making concern in need of 37 dies for the production of 400,000 shell carriers. Time allowed for design and production of the dies was six weeks. After canvassing all Southern tool shops, and checking as far north as Chicago without success, the Atlanta concern learned of the Automotive Tooling Information Service.

The Service found a source immediately. The dies were delivered before schedule. THE END

Charles F. (Boss) Kettering, Vice President of General Motors and head of its Research Division, recently visited the plant of the Sheffield Corporation where he witnessed a demonstration of developments in precision instruments that make possible dimensional control in mass manufacturing. Dr. Kettering *(left)* chats with Louis Polk, Sheffield President *(right)*, and W. H. J. Behm, President, Winters National Bank and Trust Company, Dayton, Ohio.

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Announcing... A NEW LOW PRESSURE PUMP

PRECISION BUILT . . . OF SIMPLE CONSTRUCTION FOR HIGHER EFFICIENCY, LOWER MAINTENANCE

So simple in construction that it has only two moving parts . . . yet so efficient that it has performed jobs more successfully than any other pump . . . the Barnes *Constant - flo* Rotary Gear Pump points the way to better performance and greater freedom from trouble in your equipment.

This efficiency is made possible by the exclusive, patented Barnes gear tooth structure, together with precision methods of manufacturing. Few pumps could be more simple in design and operation. No pump can operate with less wear and need for maintenance.

Investigate the possibilities of using the Barnes *Constant-flo* Rotary Gear Pump to obtain better performance in the equipment you manufacture. Our engineers will be happy to work with you.

FEATURES

1. EFFICIENT FLUID DISPLACEMENT. Precision manufacture maintains at an absolute minimum, variations due to viscosity and slippage. Pump is self-priming.

2. NEGLIGIBLE AERATION. (due to vacuum action) because each tooth completely fills mating space in patented Barnes gear tooth structure. Precision machining throughout.

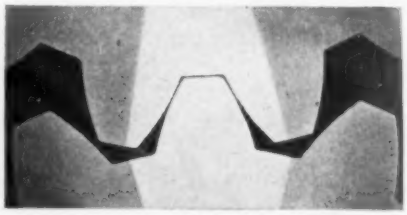
3. NEGLIGIBLE WEAR because teeth mesh in a rolling action, elir 'nating excessive sliding. Pump has only 2 moving parts.

4. NEGLIGIBLE MAINTENANCE because no external means of lubrication and no separate bearings are required. Simple construction makes it possible to take the pump apart and reassemble it in a jiffy.

5. CONVENIENCE — Pump is small, compact — weighs only 3½ lbs. Can be mounted in any location convenient to power take-off.

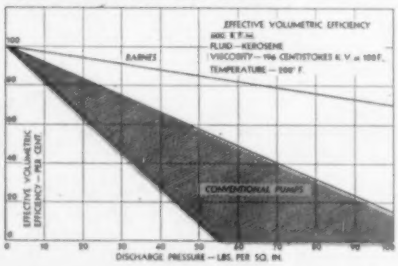
6. PUMP DELIVERY — To 350 gallons per hour at 3600 R. P. M.

NOTE THIS GEAR TOOTH STRUCTURE



Two sturdy spur gears rotating inside a housing provide efficient fluid displacement in the Barnes *Constant-flo* Pump.

NEW PUMPING EFFICIENCY


EFFECTIVE VOLUMETRIC EFFICIENCY
FLUID — KEROSENE
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TEMPERATURE — 100° F.
BARNES
CONVENTIONAL PUMPS
EFFECTIVE VOLUMETRIC EFFICIENCY — PER CENT
DISCHARGE PRESSURE — LBS. PER SQ. IN.

SOME TYPICAL APPLICATIONS

This pump can be used for all liquids having lubricating qualities. It makes an excellent fuel pump for industrial oil burners and other similar applications. It is an important part of a highly efficient torque converter. It can be used as a lubricating booster pump for oil lines, as a gasoline dispensing pump, and for oil pressure systems on all types of internal combustion engines. The latter suggests its usefulness in heavy automotive equipment — trucks, tractors, etc.

TEST IT ON YOUR EQUIPMENT AT NO COST

We'd like to place one of these pumps in your plant — on your product — so that you can check and compare to your own satisfaction. To any bonafide manufacturer of equipment using a fluid pump, we will ship for trial purposes a new Barnes *Constant-flo* Rotary Gear Pump.

Test it on your present and experimental equipment! Put it up against the very best pump you've ever purchased and compare efficiency and performance . . . compare simplicity . . . compare convenience of size, weight and construction.

If you are interested in convincing yourself of Barnes pump superiority, write Department LL, describing your problem, fluid capacity, pressure, pump speed required, etc.

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Get complete information on the Barnes *Constant-flo Pump*—write now for a copy of this free illustrated bulletin. Gives specifications and capacities, also makes suggestions as to how you can put this efficient new pump to work for better performance of your equipment. Ask for Bulletin MCL244.

John S. Barnes Corporation ROCKFORD, ILLINOIS

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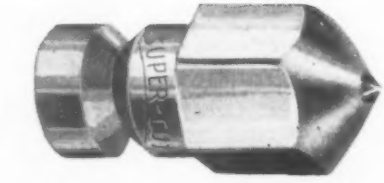
Cut wheel costs 40 to 75%



SUPER-CUT

DIAMOND TOOLS

25 types and sizes for wheel dressing, thread dressing, turning and boring, radium forming. Each diamond carefully selected and correctly fitted by exclusive Super-Cut lock mounting process. Perfection absolutely guaranteed!

Accurate, long-term records of leading plants from coast to coast definitely prove that Super-Cut Zurium Bonded diamond wheels materially reduce grinding and finishing costs! Because these wheels last ***so much longer*** on even the toughest jobs, thanks to Super-Cut's exclusive Zurium Bonding process, they actually cut wheel costs as much as 75 per cent! Super-Cut Diamond Wheels, in a variety of types and sizes, are available for immediate delivery. Write today for complete information.

Write for Free Catalog Today, also for Brochure on Diamonds.

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Large extrusion mill is one of many facilities which make Ampco Metal, Inc. a complete, self-contained source of copper-base alloy parts.
Ampco Extruded Hollow Rod
saves metal, saves machining time and cost . . .

All the inherent advantages of Ampco Metal — its exceptional resistance to wear, impact, fatigue, and corrosion—its specific properties as an engineered aluminum bronze alloy, held within close limits by rigid quality control — are available to you in this convenient form.

Ampco Hollow Rod actually is replacing forged material in valve seats for aircraft engines — evidence of its clean, sound structure and excellent physical properties. It is intended primarily for bushings, sleeves, lead-screw nuts, and similar machine parts. Sizes closely parallel most requirements — saving material and time.

Ampco has a specialized engineering and production "know-how" — and the complete facilities for parts production by the process that *should* be used for *your* purpose. Ampco's nation-wide organization of field engineers is ready to assist you. Call on us. Write on your business letterhead for your copies of Engineering Data Sheet 125 and the Ampco Metal Catalog.

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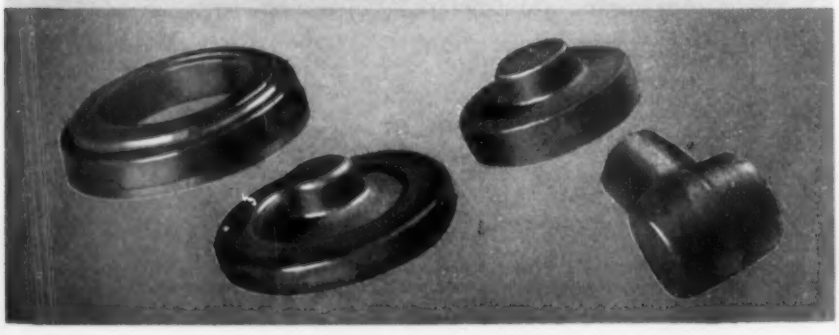
A-5B

Ampco Metal Parts fabricated from extruded stock



PLASTICS FOR TOOLS

(Concluded from page 102)

100° F., at which they will withstand tremendous impacts. The preheating process is accomplished by placing the plastic tool in a room having the proper temperature for a period ranging from 12 to 24 hours.

Since most thermoplastics with high impact strengths have ethyl-cellulose bases, materials such as Plastalloy should not be stored or subjected to extreme temperatures.

Plastalloy is especially useful in making double-action press and drophammer punches, because it has a flow coefficient of approximately 39 per cent. This factor eliminates the necessity of clearing the punch for metal thickness.

Preparing thermoplastic molds is very simple. For casting a punch into a female Kirksite die, a wooden frame lined with tin is built around the die. The material is poured at approximately 300° F., and allowed to cool; then the Kirksite die is heated with a foundry torch or equivalent to a temperature of 350° F., and the thermoplastic punch is set in the female die for five minutes. When the surface of the punch has flowed to all contours of the die, both the punch and die can be quenched with cold water, after which they will have identical contours.

Plastalloy punches can be cast in plaster molds, if the molds have been treated with a thin hard film of Eronel Number 515 or similar material to eliminate porosity.

RESEARCH BEING CONTINUED

All plastic punches should be cast to a thickness of at least 8" above the highest point of the female die, and sufficient holes should be drilled (slightly under normal size) or 5/8" diameter lag screws which are used in securing the punch to the ram table. Tapping screw holes is unnecessary, because the consistency of the material is adequate to enable the lag screws to form their own threads.

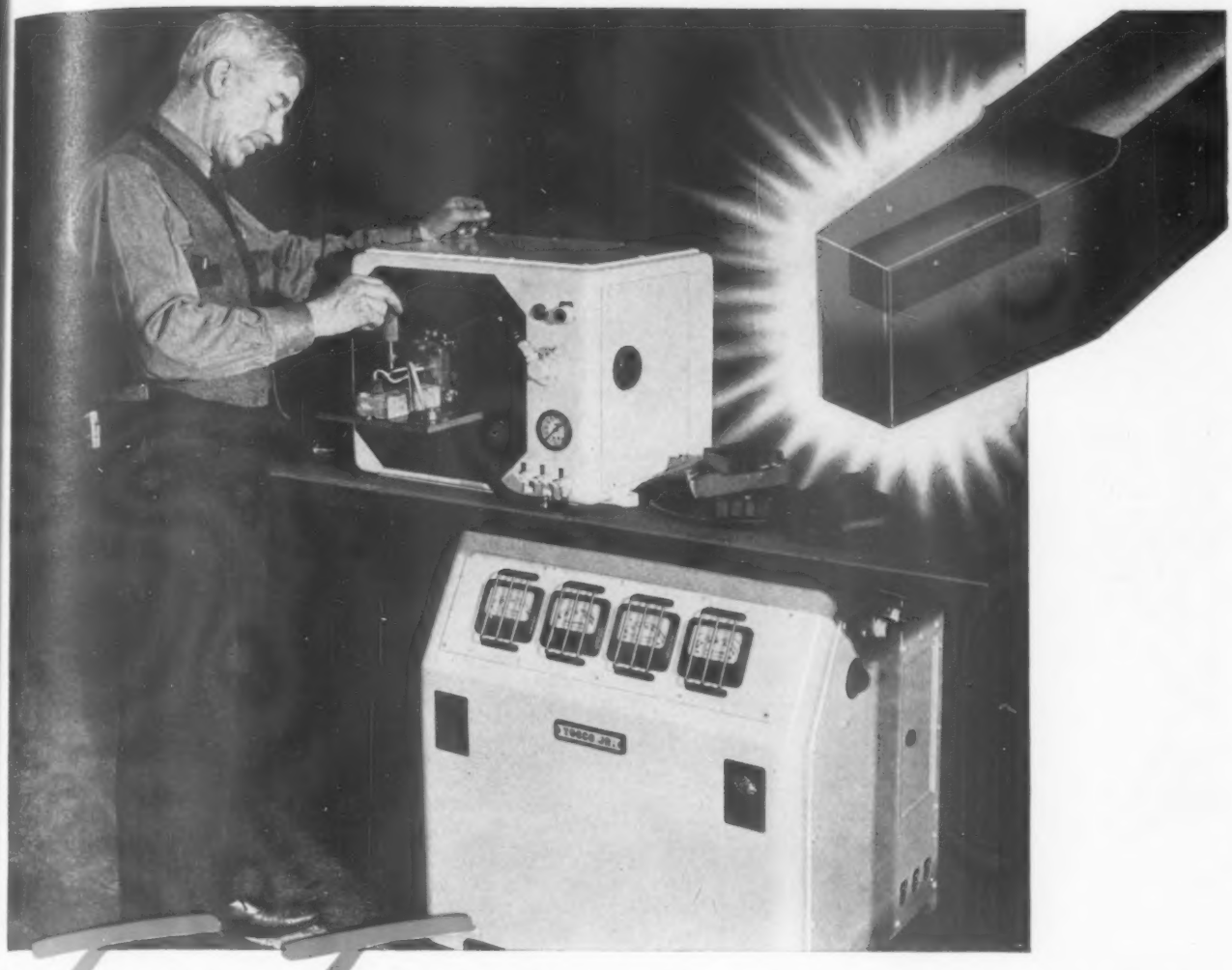
"By careful experimentation," continues Wilson, "we are learning what tools to make from plastics. Considerable research is still being conducted on both types of plastics to decrease porosity and insure less chipping from the bases and edges of the tools; also to increase the compression, flexural, and tensile strengths. However, in this connection, it should be remembered that plastic tools are precision instruments the same as metal tools; and, if they are handled with equal care, they may be utilized with equal success.

"Because they can be fabricated more rapidly and economically," he explained, "the use of plastic tools should be encouraged for both war and postwar manufacturing." THE END

THE SCIENCE OF PRODUCTION

• **"In our manufacturing business the first production of anything is the most difficult. If you can get 10 per cent of the production going, then you can multiply that on up."**

C. E. WILSON
President, General Motors



TOOL-TIPPING ... 5 TIMES AS FAST WITH "TOCCO"

IN the brazing of carbide tool tips, a large automobile and aircraft manufacturer formerly required 5 men at 8 hours each, or a total of 40 man-hours per day . . . Today, with TOCCO, 1 man does the same amount of work in 8 hours . . . Saving 32 man-hours per day.

TOCCO brazes tool tips with the same efficiency that it does a multitude of heat-treating tasks. At the push of a button, it heats standard size tool tips to brazing temperature in 10 to 30 seconds for a tight, uniform braze. Clean, cool and compact, the TOCCO machine can be located handy in tool room or production line to speed output and minimize motions.

NEW LOW-COST TOCCO

The 7½ K.W. TOCCO JR. shown above is ideal for brazing tool tips and heat-treating many small machine parts. Power unit can be located under a bench, out of the way. Detachable work unit can be mounted on work bench as shown above. Like larger TOCCO units, it is of rugged motor-generator type, assuring dependable, low-cost operation. Fully described in Bulletin 16A, free on request.

THE OHIO CRANKSHAFT COMPANY • CLEVELAND 1, OHIO

TOCCO

HARDENING..BRAZING
ANNEALING..HEATING

★

PRODUCTION ROUND-TABLE

(Continued from page 105)

ments. Determination is made of the tools and machines best suited for producing each new item, and actual tooling and production setups often are worked out, he said.

New tools and new machines with which production men in the company's plants may not have had previous experience are first tested in Central Manufacturing, thus eliminating duplication of research and interruption of production in numerous company shops.

When Weaver observed that he believes that "all of us will be working to closer tolerances after the war", Round-Table discussion centered on a subject of vital importance to both producers and users of machine tools. All six of the production men agreed that in their shops today they were working to closer tolerances than before the war.

Jacques and Sharpe of Motor Products and Wagner of Ford are all inclined toward the belief that product design will force the adoption of closer tolerances in automotive work soon after the war. Smila looks for an eventual trend toward closer tolerances in automobile manufacture, but pointed out that the immediate cost factor would retard any big swing toward immediate adoption of tolerances approaching those in war production.

"Many factors as yet undetermined, including use of 100 octane fuels and new materials from the product design standpoint, and the need for new high precision, high production machine tools from the manufacturing standpoint, make a prediction unsafe," Smila reasoned.

What trends do Detroit production men foresee in metal-cutting and machine tools? Six Motor Capital executives look to postwar at the PRODUCTION Round-Table

Pointing out that GM production men will maintain tolerances as close as their product engineers determine is necessary from the standpoint of product reliability, Johnson said that personally he didn't look for finer finishes soon after the war.

"Machine tools must be changed to maintain these closer tolerances at a much faster rate of production before we can afford them from a cost standpoint," he said.

Taking a long range view and assuming that necessary improvements in machine tool designs will be made, Weaver predicted product competition after the war would soon force adoption of closer tolerances.

Changing the subject of discussion, Weaver asked the auto men what, from a production standpoint, they expect will come out of this war. "Out of the last war we witnessed skill transferred from the man to the machine. That was when we first learned how to tool for precision production. What technological developments can we look for out of our current war production experience?" he queried.

Smila said he foresees much development in the field of mechanical handling to help cut manpower costs as machining feeds and speeds are stepped up. "Heavier machine tools to handle carbides are a certainty," he predicted. "There isn't one machine tool in 10 that will give you the potential of today's carbide tools."

Jacques pointed to the numerous technological developments in metal fabricating and finishing that have been developed during the war and are yet to be applied in the production of peacetime products.

With representatives of the nation's largest users of machine tools gathered around one table, the Editors naturally probed for an answer to the much discussed question of what kind of a postwar market mass production industry in general and the auto industry in particular will offer machine tools.

Weaver crystalized the various answers with the observation that "machine tool builders will have a postwar market exactly commensurate with what they offer us."

Boiled down to a few words, the entire gathering agreed that if new machine tools are introduced that will cut costs, few industries will bother to go into the war surplus market.

"The builders need not worry about the 500,000 surplus machine tools you speak of if when the war is over they offer industry machine tools that are better than those we are using today," Smila stated.

Agreeing with Smila, Johnson added, "the builders haven't made any substantial improvements on their machines since 1936." Johnson amended this statement by explaining that the builders could not be blamed for this condition in that they have been able to meet defense program and war production machine tool requirements only through Herculean efforts. Taking time out to redesign their products would have proved catastrophic, he said.

Interesting opinion was offered in discussing the machine tool industry's proposed plan to assist in the disposal of surplus war-built machine tools by pushing the sale of a few surplus machines with each sale of new machines.

This program may work in other parts of the country, the Detroit Round-Table agreed, but it will only interest the automobile industry during the reconversion period.

Johnson pointed out that General Motors is now using 60,000 government-owned machines tools, half of which are of types and sizes not applicable to production of any of the Corporation's peacetime products.

"We can't use more than 15 per cent of the government-owned machine tools in our plants after the war," he explained. Before the war GM used a few hundred turret lathes, but today it is using thousands. The same condition prevails in respect to boring mills and small mills, Johnson added.

Widespread belief that Ford may be able to beat the field in reconversion to automobile production was confirmed in the personal observation by Wagner that "we can conduct a good automobile production program with the machine tools we have today."

Regarding the Government-owned machines in Ford shops today, Wagner said he believed that probably 15 to 17 percent of them were applicable to the company's peacetime production plans.

POSTWAR MACHINE TOOL REQUIREMENTS

Discussion of projected postwar automobile production revealed the belief that machine tool purchases will be limited to replacement during the first reconversion period. Automobile output during this initial stage is limited by present War Production Board policy to 55 percent of pre-war output. When all restrictions are removed by Washington and output is pushed to 100 percent of pre-war production, heavy orders of special machines will certainly come from Detroit, it was predicted.

When automobile production climbs from the pre-war peak annual volume of 5,600,000 cars and trucks to an anticipated 7,000,000 units, machine tool requirements will be unpredictable, the auto men stated. Specific requirements in postwar machines visualized by the group included heavier bases, more power, better and more accessible controls as well as faster work handling.

Smila is looking for the development of rotary and other types of mills capable of handling carbides. The development of more machines to handle negative rake carbides, he said, would "certainly produce a ready-made market for the builders." Stepped-up horsepower is another requirement specified by the Plymouth production man. "Fifteen horsepower must be boosted to 50," he said.

Wagner sees a "wide open field for builders in doing more machining in one setting." Citing the Ford auto engine line where it takes about 65 operations to clean up the cylinder block alone, he said "there are far less than 65 separate handlings. Many multiples of these operations are combined in one setting. The cost of reloading especially heavy parts is extremely high. Also, with reloading, the possibility of many errors which interfere with interchangeability are introduced.

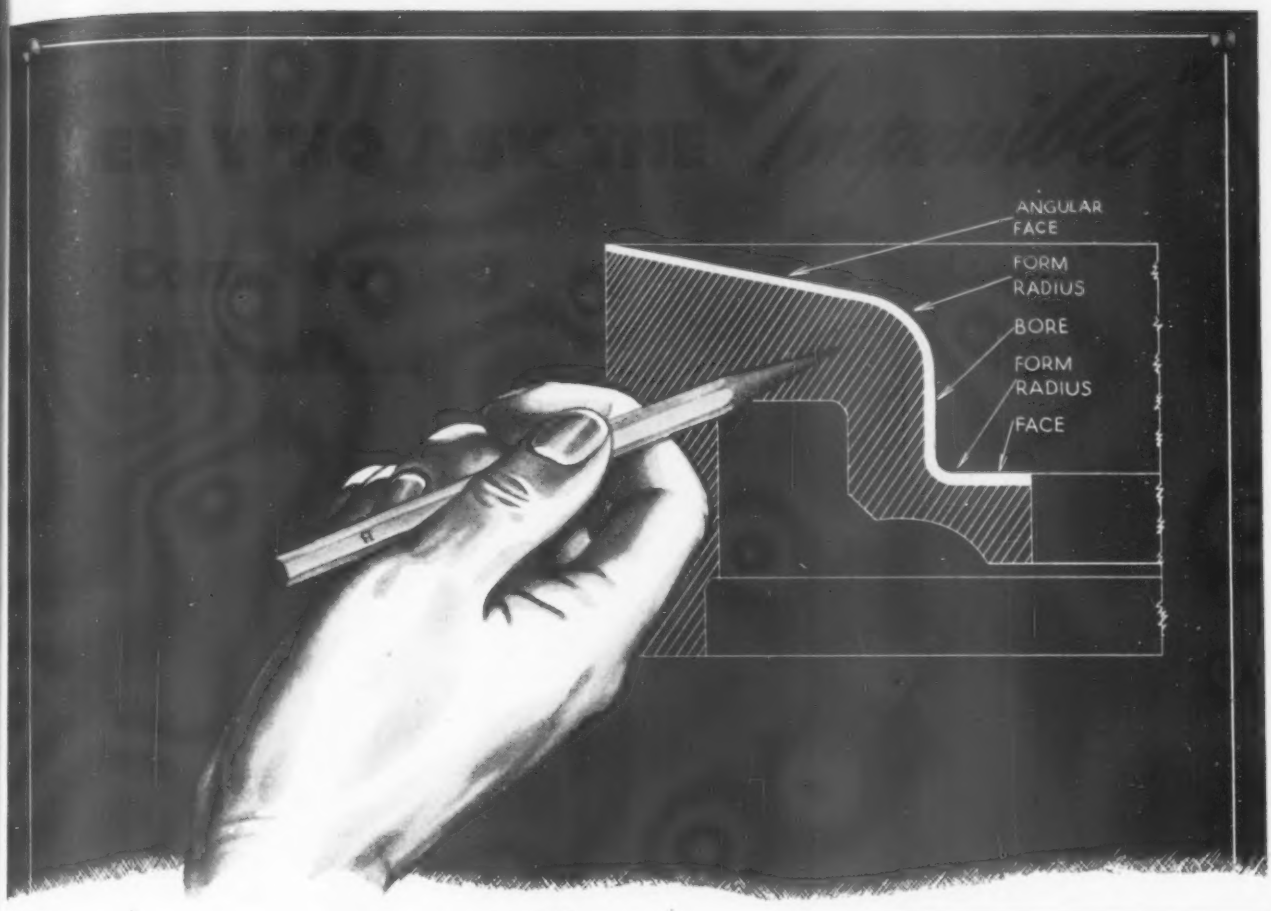
CRITICAL NEED FOR PRESSES CITED

"Ford always endeavors to purchase a machine suitable for a particular operation. The universal application of the machine is considered secondary," Wagner explained.

A previously unpublicized machinery requirement at General Motors was cited by Johnson, who pointed out that the Corporation's divisions are in need of at least 4,000 machine tools in order to resume peacetime production. "At least 500 necessary presses are missing from our plants right now," he said.

Not yet understood in many quarters is cause of the automobile industry's need for machine tools to resume even

(Concluded on page 138)



AND GET IT WITH *Precisioneering!*

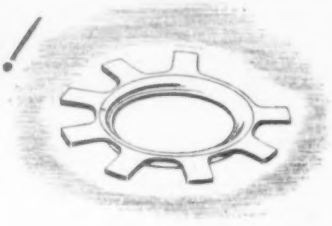
Yesterday's "impossibilities" are today's production achievements. And *today's "impossibilities"* will be the means of putting your post-war product one jump ahead of competition.

Finding ways to step up production rates . . . or finish more surfaces per machine . . . or hold closer tolerances . . . or minimize rejects. In short, to make a better product at lowest possible cost.

That is the essence of what Heald *Precisioneering* offers you. And it inevitably results when we add custom-built tooling and fixtures to a carefully selected basic machine design.

Why not sit down with some of the 250 *Precisioneers* at Heald Headquarters in Worcester . . . or call in one of our local field engineers. They will offer for your consideration *proved* ideas and production methods for improving your boring, turning, facing and grinding operations.

THE HEALD MACHINE CO.
WORCESTER 6, MASS.



Another Example of

PRECISIONEERING RESULTS

Formerly **two machines were needed to finish this knuckle pin locking plate. It was a tricky operation as the section view at top shows. Production lagged. *Now*** **a single Bore-Matic bores a 4.0455" hole, forms a .06" radius and generates the bottom face; generates the 14° angular face and plunge cuts a .13" radius to blend with it and the bore — *all automatically!***

HEALD *for precision plus . . . economy plus*

Internal and Surface Grinding Machines • Bore-Matic Precision Finishing Machines

Here's another outstanding performance record for WINTER Taps.

Pressed-steel shells were tapped with 5/16-inch, 24-thread WINTER Taps, at the rate of 28 pieces per minute — as against 17 per minute with taps formerly used.

Tapping speed; 2300 RMP. Cutting speed; 185 surface feet per minute.

On this job WINTER Taps averaged 6000 to 15,000 holes per tap before grinding was necessary. Compare this with the average of only 3000 holes per tap, of taps formerly used.

Value and service are two main items you get when you specify WINTER Taps. Winter Engineers will gladly recommend the right taps to solve your threading problems.

Winter Brothers

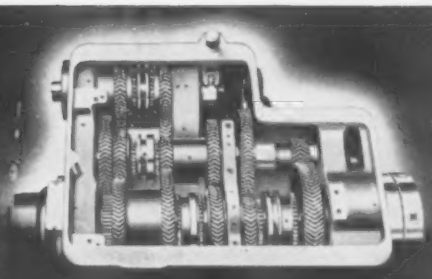
COMPANY

BRANCH STORES

Wrentham, Massachusetts, U.S.A.

SAN FRANCISCO, CALIFORNIA · CHICAGO, ILLINOIS · DETROIT, MICHIGAN

RIGID BED CONSTRUCTION



CONTINUOUS TOOTH 30° HELIX HERRINGBONE GEARED HEAD

Sidney

40TH ANNIVERSARY

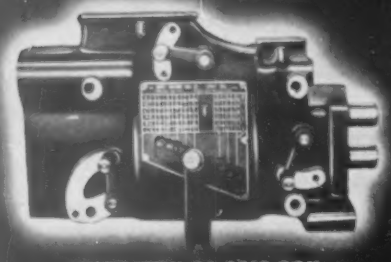
Courtesy Rockwood Sprinkler Co.

For your precision jobs use a SIDNEY LATHE

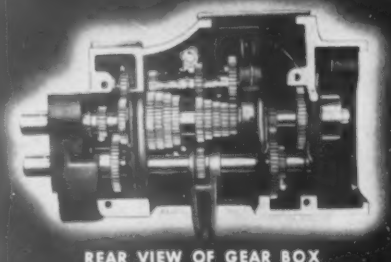
Turning Die Parts as shown here is only one of a host of precision jobs handled on Sidney Lathes—quickly—easily—accurately.

The continuous tooth Herringbone geared head assures a smooth flow of power to the spindle—greater strength—and freedom from end thrust due to opposed helix angle.

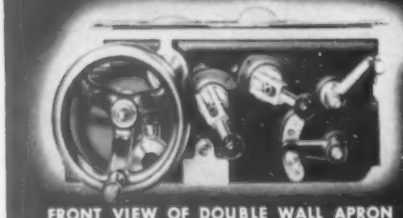
This is only one of many design and construction features of Sidney Lathes that permit high production—precision work—and low cost operation. *Bulletins on all sizes available.*



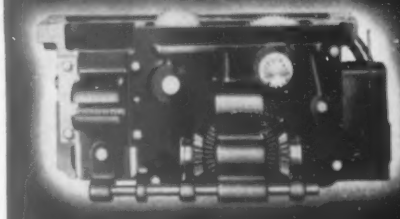
FRONT VIEW OF GEAR BOX



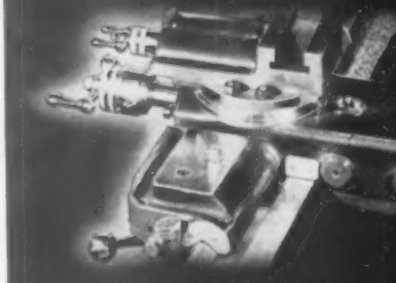
REAR VIEW OF GEAR BOX



FRONT VIEW OF DOUBLE WALL APRON



REAR VIEW OF DOUBLE WALL APRON

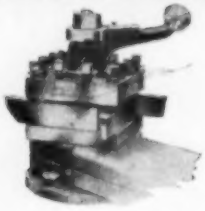


SIDNEY COMPOUND REST

The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO



Send for the No. 16-E Turret Tool Post Catalog

Gives Engine Lathes the Versatility of Turret Lathes

NO stopping the lathe for tool changes on this job. The McCrosky Hexagon Turret carries all the tools needed to face, drill, bore and ream, permitting the operator to index the next tool into cutting position, quickly and accurately.

Mounted on the T-slot of the compound rest, or bolted on the main slide, McCrosky Turret Tool Posts permit engine lathes to be used on many complicated jobs previously assigned to more specialized machines. They have proved their efficiency and economy on every type of lathe,—and all kinds of work.

McCrosky Turrets save time otherwise required for tool changes. They assure increased production and reduced operating costs. Furnished in 5 styles, including square and hexagon designs, and 6 different sizes. Write for complete details today.

McCROSKY

COST CUTTING TOOLS

TOOL CORPORATION

MEADVILLE, PA.

Designers and Manufacturers of

Jack-Lock MILLING CUTTERS · *Block Type* BORING BARS

Wizard CHUCKS AND COLLETS

Super Adjustable REAMERS · *Turret* TOOL POSTS

PRODUCTION ROUND-TABLE

(Concluded from page 134)

limited passenger car production. When the nation converted to all-out war work, all major companies connected with the automobile industry agreed to participate in an industry-wide machine tool pool. Whatever machines each company could not apply on its own war contracts it listed with the Automotive War Production Council, war-time version of the Automobile Manufacturers Association. Such unused machines were thus made available to any and all United Nations war industries.

AUTO INDUSTRY TO INFLUENCE DESIGN

Today, hundreds of machine tools, presses and miscellaneous machinery once used in automobile or automobile parts manufacture are in use on war production in Russia, England, South Africa, Canada and Australia. As Smila explained at the Round-Table, "the machines the auto industry is trying to get right now are to replace the equipment lost in the war shuffle. Some of this equipment is needed in order to get the first cars off the line. While a certain amount of these machines are to have new and improved features, the major portion is the same as was used on our pre-war lines and would be classified as replacement equipment."

Because the automobile industry alone may for some time provide one half or more of the total postwar American machine tool market, the machine design requirements of this industry undoubtedly will be a major influence in determining the types of new machines offered the rest of the metal-working industry. If this condition is construed as wrong, it will be beyond the ability of many machine tool builders to rectify. To a large extent, they, like any industry, must embody in their product the requirements of the major portion of their market.

POSTWAR AUTO PRODUCTION NEWS

From the view point of the Detroit production men, the postwar relationship of automobile production to machine tool requirements will shape up something like this:

Stage One will witness the introduction of 1942 model cars at 55 percent of pre-war annual output. Replacement machine tools of pre-war design will be purchased. As Johnson said, "we will buy anything we can get."

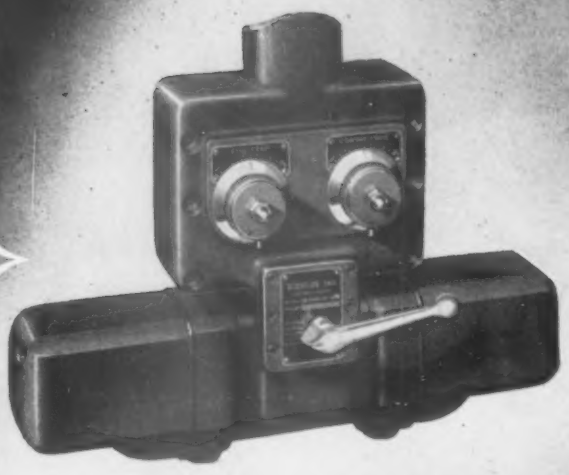
In Stage Two, cars will be refined somewhat from the design standpoint, output will reach 100 percent of pre-war volume, and a market will be offered for improved machine tools.

Arrival of Stage Three will depend upon the time required to complete new postwar product designs. Then, with the development of new production tooling for output estimated at 150 per cent of postwar volume, the machine tool industry will be provided its first big postwar market.

The usual 12 months before the arrival of this stage the auto industry will be looking for standard machines in which productivity is increased 25 per cent or more, and special machines designed for multiple machining operations and work handling systems to close the gap between high-speed machining and work-handling and material flow. THE END

SMOOTH and CONSTANT FEED RATE

regardless of fluctuations in work resistance or hydraulic operating pressure



Double Solenoid Type Push-button Operation

VICKERS "Traverse and Feed Cycle" CONTROL PANELS

These panels provide self-contained, compact control units for automatic machine applications where the cycle is a combination of rapid advance, one or two feeds, and rapid return motions. The two feed rates are infinitely variable within their ranges, and adjustments can be made during feed. Applications include drilling, reaming, boring, turning, milling and swaging machinery.

The hydraulic circuit in the panel employs the well-known Vickers Flow Control Valve in a "metering-out" circuit which means a smooth and constantly maintained feed rate for any given adjustment regardless of fluctuations in cutting tool resistance or changes in hydraulic operating pressure.

Simplicity is evident from the fact that there are only two working parts that move. Many standard modifications are available; feeds can be in either direction or both directions; operation is by single or double solenoids integral with panel, separate solenoids or pilot pressure. Practically any cycle sequence can be obtained. See Bulletin 41-10 for complete information.

Vickers Application Engineers will gladly discuss with you how "hydraulics" can be used to your advantage.

VICKERS *Incorporated*

1416 OAKMAN BLVD. • DETROIT 32, MICHIGAN

Application Engineering Offices:

CHICAGO · CINCINNATI · CLEVELAND · DETROIT · LOS ANGELES
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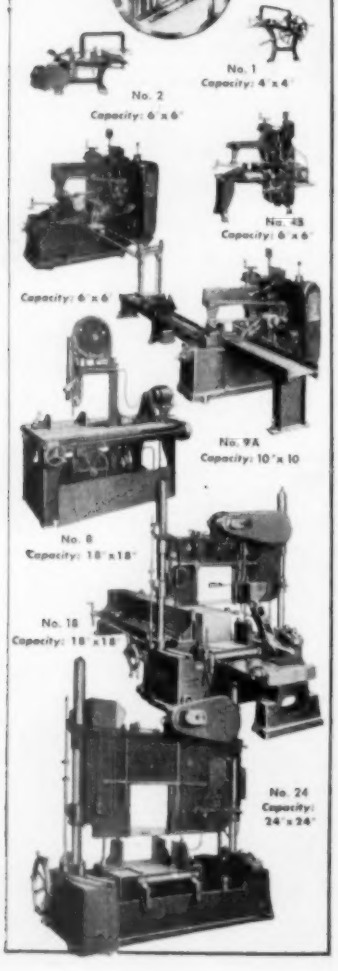
Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function

CONSTANT DELIVERY PUMPS · FLUID MOTORS · DIRECTIONAL CONTROLS · VOLUME CONTROLS · PRESSURE CONTROLS · CONTROL ASSEMBLIES · VARIABLE DELIVERY PUMPS



The MARVEL No. 8 does this job with ease — fast and economically

The Denver Shops of the Denver Rio Grande and Western Railroad, like numerous other railroad shops, have found the No. 8 MARVEL Universal Metal Cutting Band Saw Machine the ideal metal sawing machine. The illustration shows the cutting of floating rod bushings into three equal sections. Normally a difficult and expensive operation, this job is done on a No. 8 MARVEL Band Saw with ease, speedily and economically. No special tools, jigs, or high mechanical skill are required.

In railroad shops, as in many machine shops, tool rooms, and fabricating shops, there is a real need for a UNIVERSAL metal sawing machine that will cut the smallest, most delicate pieces as well as solid blocks 18" x 18". The No. 8 MARVEL Band Saw Machine answers these requirements and in addition will mitre, trim, notch and make re-entrant cuts.

The No. 8 MARVEL Metal Band Sawing Machine is but one machine in the MARVEL system. There is a MARVEL Metal Cutting Saw (either hack saw or band saw) for every shop's need. A local service engineer is available to survey your work without cost or obligation. He will recommend the best saw for your work, supplying accurate cost and production data. Write us asking for a call by a MARVEL sawing expert. A complete catalog is also available.

BUY FROM YOUR LOCAL DISTRIBUTOR

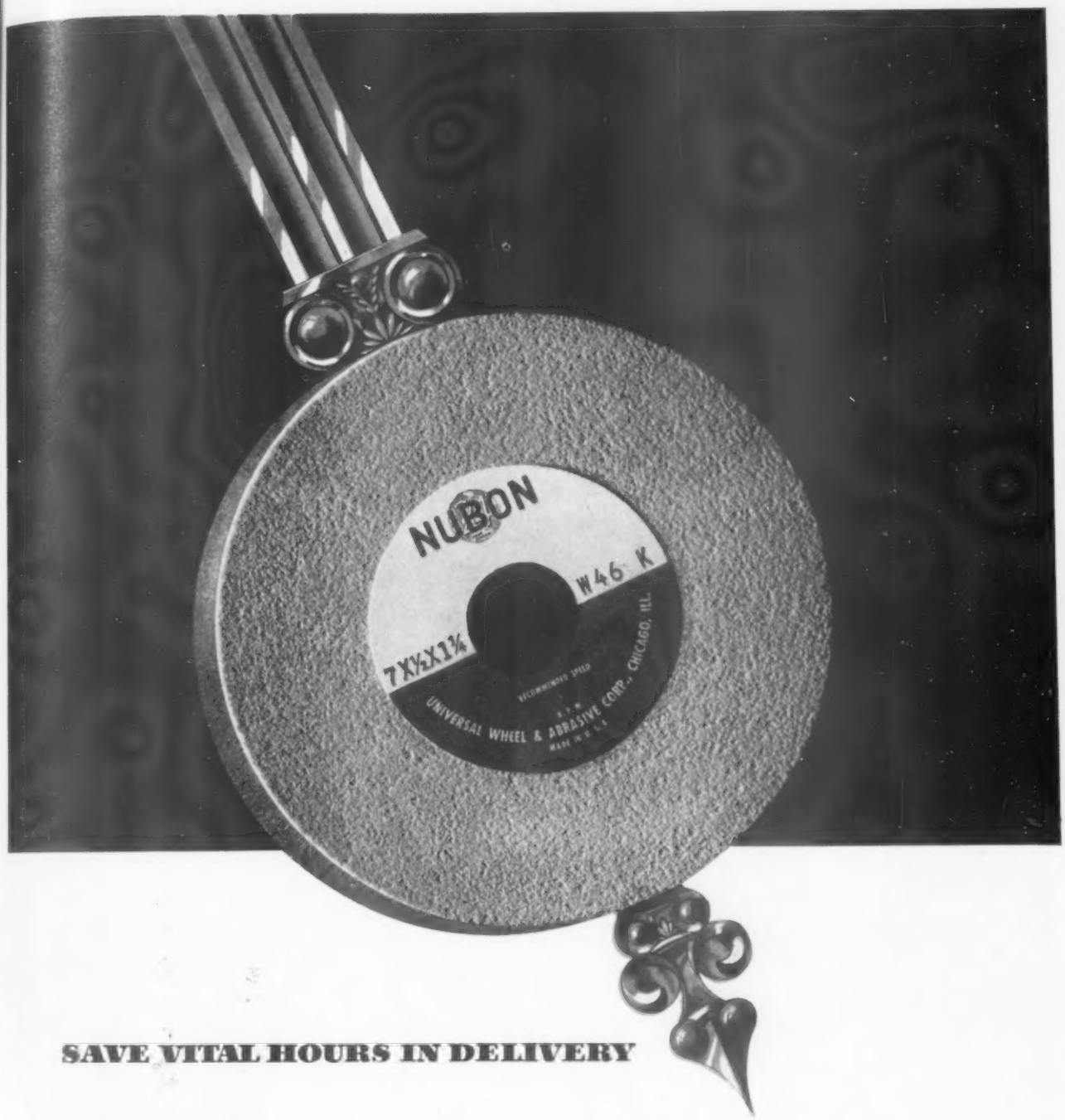
ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 W. BLOOMINGDALE AVE. CHICAGO 39, U. S. A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS



SAVE VITAL HOURS IN DELIVERY

This war demands speedy action. Universal's special process of manufacturing Abrasive Wheels and Stones meets this demand . . . with guaranteed 10-day delivery speed.

Your work demands perfection . . . for speed without efficiency is costly time lost. Through our exclusive *controlled trial plan* of engineering we guarantee grinding satisfaction.

NUBON ***Wheels are used today*** by leading American war plants to meet their most exacting war production specifications. We can also help you solve your toughest individual grinding problems.

Send at once for your copy of our new catalog

UNIVERSAL WHEEL & ABRASIVE CORP.

2626 West Van Buren Street, Chicago 12, Illinois

NUBON 24 HOUR PROCESS GRINDING WHEELS AND STONES

Send them to us **NOW!**

RECUT

Get Your High-Speed Tools Ready for the greatest rush back to Peace Time Production!

CUTTERS

READY FOR

Don't wait any longer. Take action NOW about your worn or obsolete high-speed tools.

Conversion to peace time production isn't very far off. Make your scrap pile your profit pile by having those tools you discarded recut or reconditioned. Be ready for peak production when the time comes.

Hundreds of large as well as small users of high-speed tools use Eastern Recut or Converted Tool Service exclusively. That's because our recut cutters have what it takes. They have the ability to produce equal and better than new cutters . . . to perform efficiently on the toughest jobs. Try them.

ACTION!

A COMPLETE RECONDITIONING SERVICE FOR TOOLS

NEW MILLING CUTTERS FROM OUR STOCK OR YOUR OWN STANDARD CUTTERS CAN BE QUICKLY CONVERTED TO SPECIAL CUTTERS

EASTERN CUTTER CORPORATION 30-32 Littleton Ave., Newark 7, N. J.

Chrome Plant **MASTER CHROME SERVICE** INC., 5709 Herman Ave., N. W., Cleveland, Ohio

Abrasive and Mandrel Wedded for Life

Mandrels of Blue Flash Mounted Wheels and Points retain their grip until the abrasive is completely used — so you get *all* the grinding you pay for. A special method of knurling the mandrel, and then cementing, guards against loosening, despite hard service. Furthermore, the Bay State *extra* is to size and shape *on the mandrel*, which automatically provides a positive test for adhesion of abrasive to mandrel.

A unique and improved manufacturing method by which each shape is accurately formed from a large blank, insures that the abrasive is uniform and consistent right down to the mandrel. Such consistency is maintained even in smallest sizes.

Give Blue Flash Mounted Wheels and Points a trial. You'll find they need no breaking-in period, will run absolutely true, have no hard and soft spots to give trouble, and can be used right down to the mandrel.

Just such features as these have made the complete line of Bay State Blue Flash Grinding Wheels first choice in a great many plants.

Write for helpful literature on the products you use, including a copy of Bay State's handy, pocket-sized catalog on Blue Flash Mounted Wheels and Points.

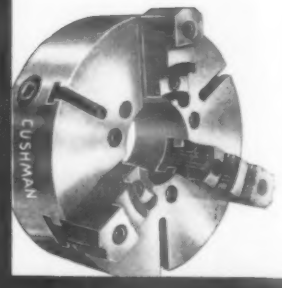
BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASS.

BLUE FLASH GRINDING WHEELS *FAST and COOL*

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS
MOUNTED WHEELS AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS · AND CYLINDERS

WARTIME LESSONS
IN WORK HOLDING . . .

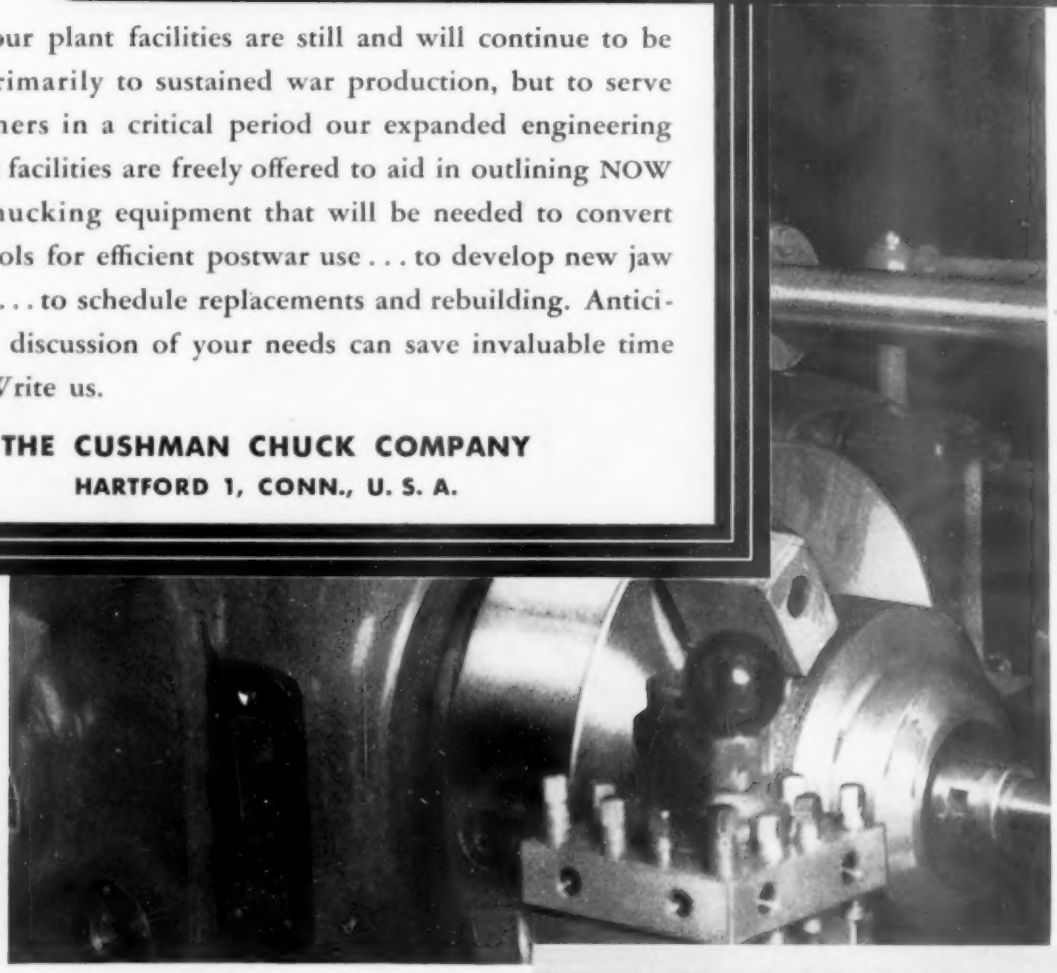
As the leading manufacturer of precision chucking equipment, Cushman has been called upon to solve . . . quickly . . . innumerable difficult work-holding problems for war plants. This experience, coupled with our prewar leadership in working with the machine tool, automotive, aviation and other key metal working industries, amply qualifies Cushman Engineers to give you practical and authoritative advice on the important retooling phase of your postwar planning.



CAN NOW BE APPLIED TO YOUR CONVERSION PROBLEMS

Naturally our plant facilities are still and will continue to be devoted primarily to sustained war production, but to serve our customers in a critical period our expanded engineering department facilities are freely offered to aid in outlining NOW the new chucking equipment that will be needed to convert machine tools for efficient postwar use . . . to develop new jaw equipment . . . to schedule replacements and rebuilding. Anticipation and discussion of your needs can save invaluable time later on. Write us.

THE CUSHMAN CHUCK COMPANY
HARTFORD 1, CONN., U. S. A.



A WORLD STANDARD FOR PRECISION

CUSHMAN CHUCKS

GRINDER ACCURACY *Safeguards* WORKERS' LIVES

LOADING DIE DIMENSION CONTROLS PRESSURE OF SENSITIVE EXPLOSIVE

•

Accurate dimensions of the die illustrated above control the pressure of the explosive packed into detonators at a shell loading plant. Too little pressure would produce dud shells—too much pressure would explode the shell during loading—with destruction as deadly as an enemy air raid. Obviously, exact dimensions of this pressure controlling die are mandatory.

The operator responsible for these dimensions finish grinds the die (within a tolerance of .001") with a No. 5 Dumore Grinder and DC Quill. The stability, accuracy and controllability of this tool enables him to meet the exacting requirements of the Ordnance Department, guarantee safe and effective loading of the highly explosive detonators and maintain the essential high production depending on this critical loading die.

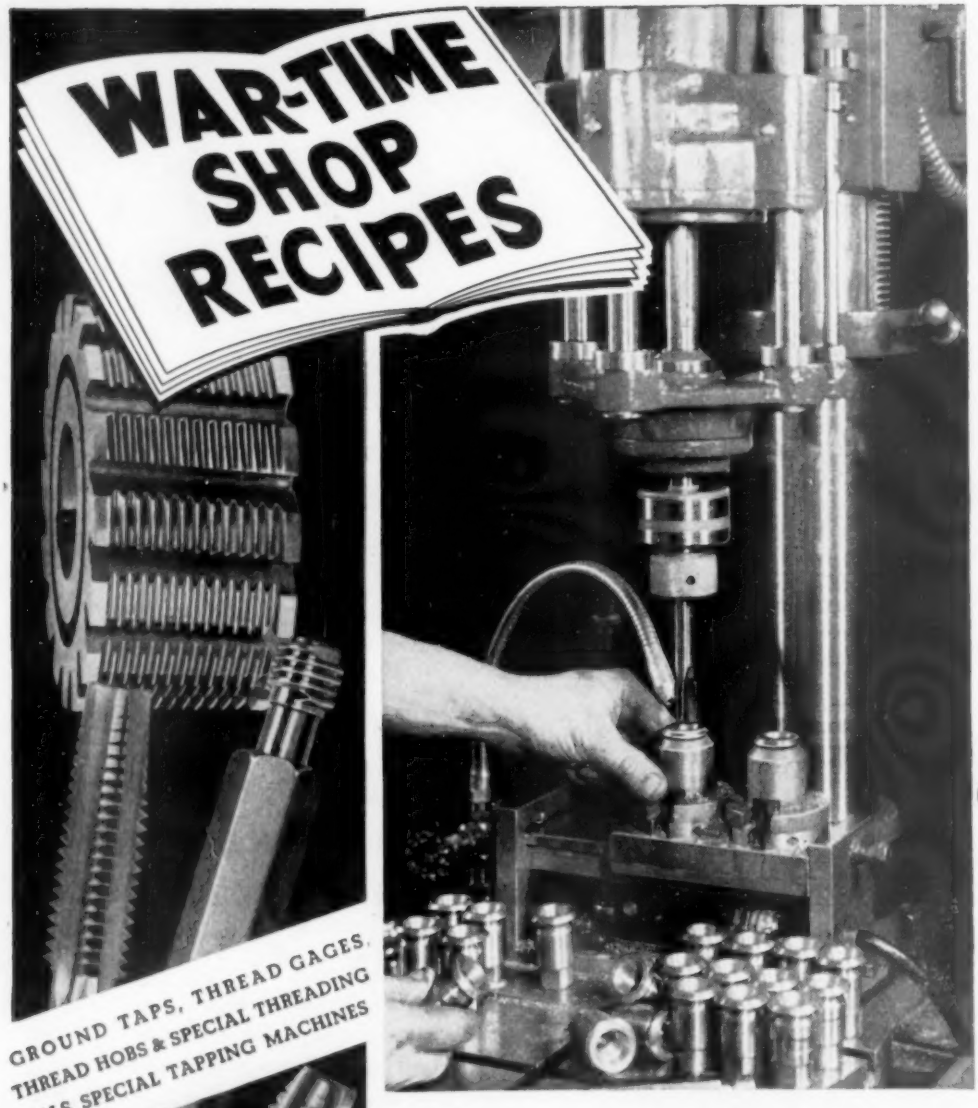
If precision grinding at low cost would be a valuable factor in your production, ask your local distributor for more detailed information on Dumore Grinders or write to The Dumore Company, Tool Division, Dept. TM43, Racine, Wis.

Ideas — from the actual experience of thousands of Dumore users — will be helpful to you. Dumore Publications describing them are yours for the asking. Write us today.

DUMORE

PRECISION AND OFF-HAND GRINDERS

SOLD BY AUTHORIZED INDUSTRIAL DISTRIBUTORS IN ALL PRINCIPAL CITIES



GROUND TAPS, THREAD GAGES,
THREAD HOBS & SPECIAL THREADING
TOOLS. SPECIAL TAPPING MACHINES

Continuous Precision Tapping with

DETROIT

light duty tapping machine and simple manual fixture

Tapping 3/4 inch 16 NF threads 1-1/4 inches deep (Class 3 Fit) in a blind hole takes less than 10 secs. per part in continuous production on this "DETROIT" LTM lead screw tapping machine.

Virtually eliminated rejections. Drive to tap is taken off base of lead screw eliminating wind-up effect.

High production rate achieved made additional machines unnecessary to maintain required production.

Other features of the "DETROIT" Light Duty Tapping Machines include:

Adjustable tapping head.
Full length triple tap-spindle guides.
Three selective spindle speeds.
Multiple disc friction clutch reduces tap breakage.
Lead screw is hardened and ground. Two-piece bronze nut. Completely enclosed. Quickly interchangeable.

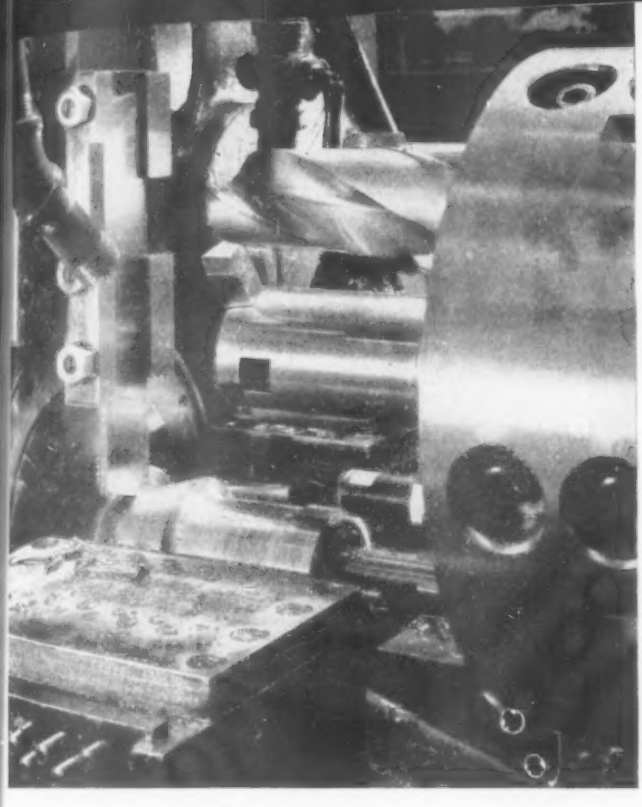
For complete information ask for Bulletin #LTM-44.

BUY U.S. BONDS STAMPS

DETROIT TAP & TOOL CO.

8432 BUTLER
DETROIT 11,
MICH., U.S.A.

Sets Up Quickly Runs Profitably on CLEVELAND AUTOMATICS with UNIVERSAL CAMMING



THE job shown in work in the photograph at left was processed on a Cleveland *Single Spindle* Automatic. The savings made, in cost and in production time are typical of savings anyone concerned with production wants to make, so give a moment's consideration to this case history . . .

Stock . . . 6½ inch bar, 4160 steel, hot finish.

Operations . . . Gauge, rough drill, rough turn O. D. in two stages, form O. D. complete, rough bore, finish bore, ream and cut off. Finish length 9 1/16 inches. Length of body (formed with one tool) 6½ inches.

This Job Was Set Up Quickly . . . because every operation on a Cleveland Automatic is controlled by standard cams, easily reached and quickly set to any position with the aid of an exclusively Cleveland universal adjustment feature. All control settings are simplified by quick-reading calibrations which reduce original set-up time to a remarkable minimum, also make it possible to retool accurately for a re-run.

Ran Profitably . . . because one Cleveland accomplished what two machines and operators had formerly done, resulting in a saving of more than 62 per cent. This is typical of Cleveland Automatic economies.

That is why, with production men, Clevelands have a reputation for two important advantages . . .

- **1.** Maximum sustained production on long runs, with minimum down time for adjustments . . .
- **2.** Profitable economy on small-lot, short-run jobs.

CHICAGO (6):
1408 Civic Opera Building
DETROIT (2):
540 New Center Building
NEWARK (4):
902 American Insurance Bldg.
CINCINNATI (12):
4932 Beech Street
HARTFORD (1):
529 Capitol National Bank Bldg.

THE CLEVELAND AUTOMATIC MACHINE CO.
CLEVELAND 3, OHIO

Quick-As-Wink •• CONTROL VALVES

Unique Principle Gives Sensational Performance

Millions of operations without leakage or repairs is the common record of Quick-As-Wink Valves. No metal-to-metal wear gives long life in uninterrupted hard service. Extremely quick acting because inherently balanced. The widest range of types and sizes provides engineers with a valve exactly suited to any and every need.

The Quick-As-Wink line of air and hydraulic operating valves offers a wide selection for practically any requirement.

THE HIGHER THE PRESSURE — AIR WATER OIL — THE TIGHTER THE SEAL

C.B. HUNT & SON

1868 E. PERSHING ST. Salem, Ohio

The New Marvel of the Skies —Boeing-29 Superfortress

Each Superfortress employs four Wright 2200 h.p. engines; and the spherical form on the outside of crankcase is successfully ground in high production by Arter Rotary Surface Grinders. Crankcase section is centered accurately on magnetic chuck adjusted to hold the center of the spherical surface exactly in line with center of grinding wheel. With rotation of crankcase, in horizontal plane, its edge is intersected by edge of cup-shaped grinding wheel rotating in vertical plane.

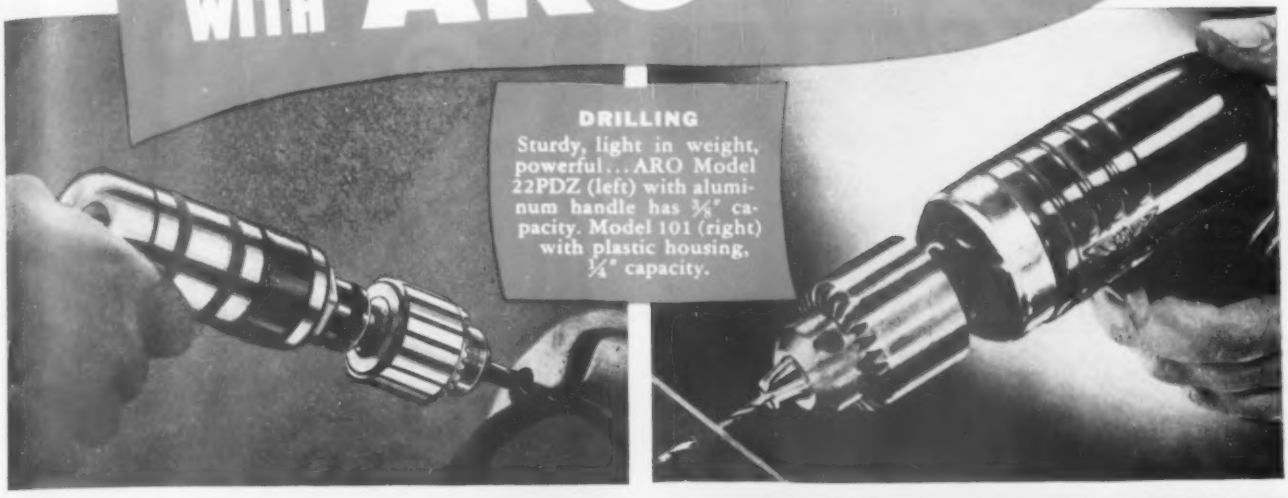
Arter Rotary Grinding Machines are Versatile Grinders

ARTER GRINDING MACHINE COMPANY

ARMY NAVY

WORCESTER, MASSACHUSETTS • U. S. A.

DO IT *better and faster* WITH ARO PNEUMATIC TOOLS



DRILLING

Sturdy, light in weight, powerful... ARO Model 22PDZ (left) with aluminum handle has ⅜" capacity. Model 101 (right) with plastic housing, ¼" capacity.

GRINDING

Simple, stall-proof... for scores of grinding, burring and filing operations. ARO Model 22BDG (left) for 2" heavy duty production grinding. Model TG Turbine Grinder (right) for fine finish work, 75,000 R.P.M.

New! **IMPACT TOOLS**

ARO TORQUE CONTROL... with new simple impact mechanism... eliminates stretching, stripping or "burning" in nut setting or screw driving. Model 106 (left), ¼" capacity, reversible. Model 131 (right), ¼" to ⅜" capacity, reversible.

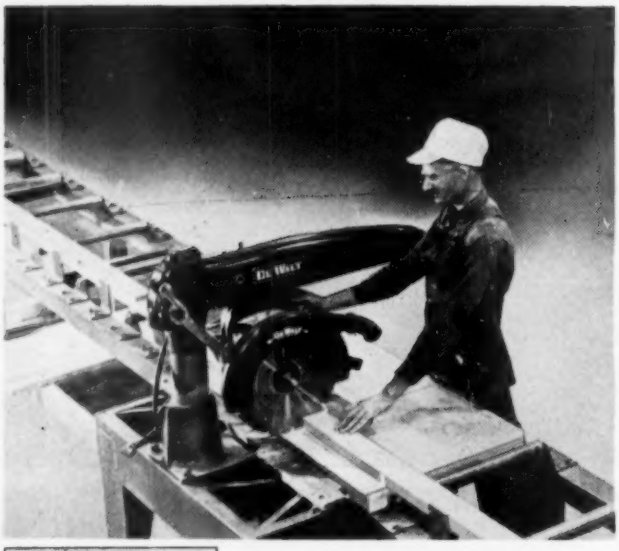
PNEUMATIC ARO TOOLS

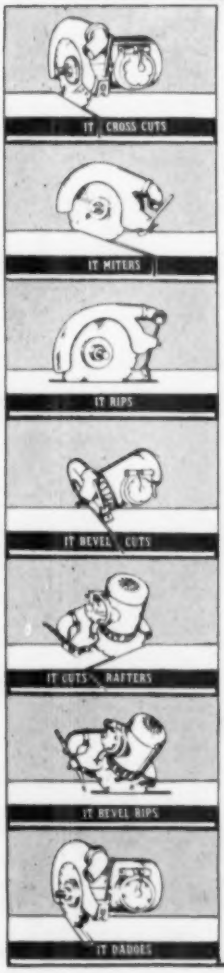
THE ARO EQUIP. CORP. BRYAN, OHIO

WRITE FOR BULLETINS

THE ARO EQUIPMENT CORPORATION
BRYAN, OHIO

DeWALT ANSWERS INDUSTRY'S NEED FOR A VERSATILE ALL-PURPOSE CUT-OFF SAW!





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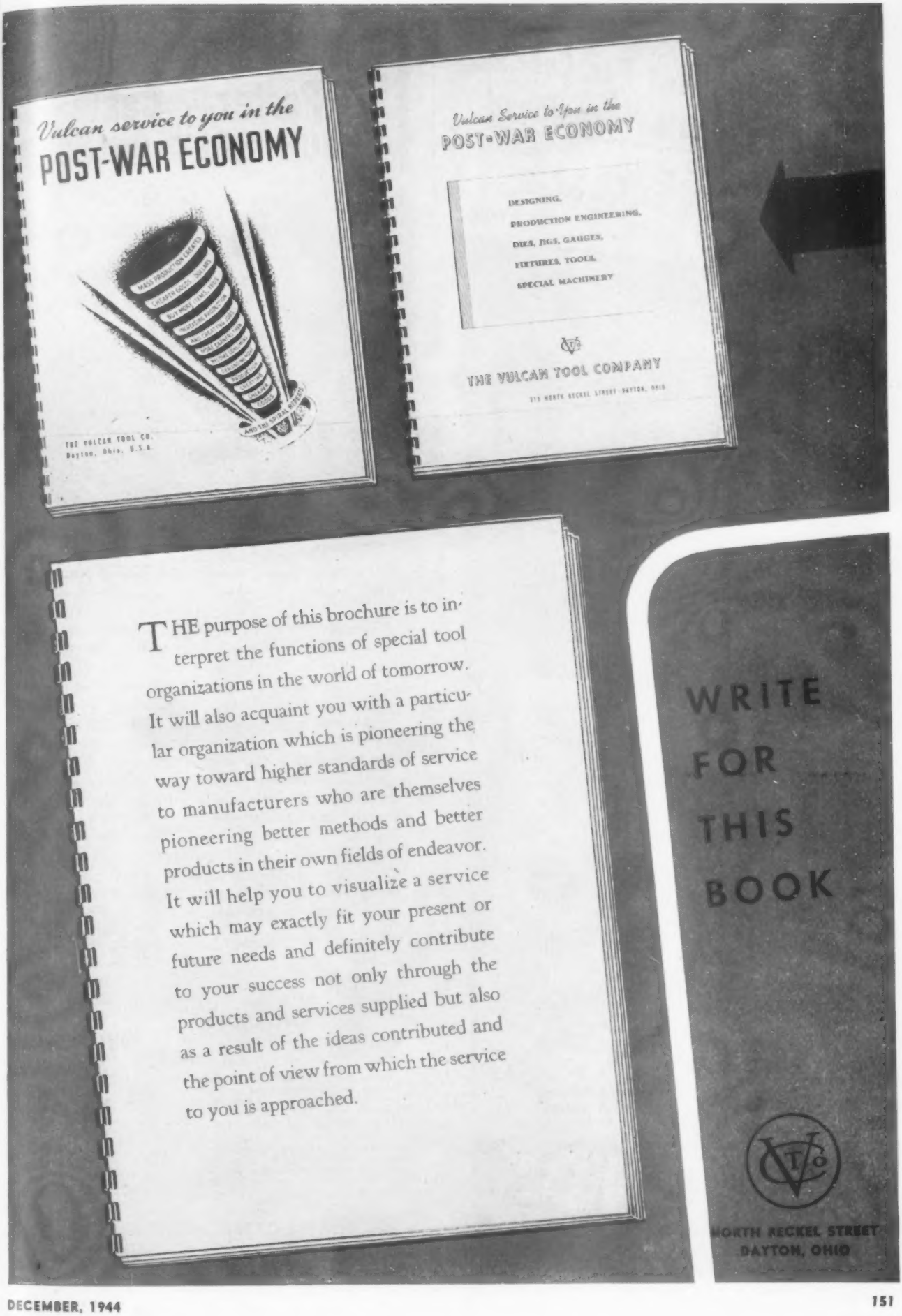
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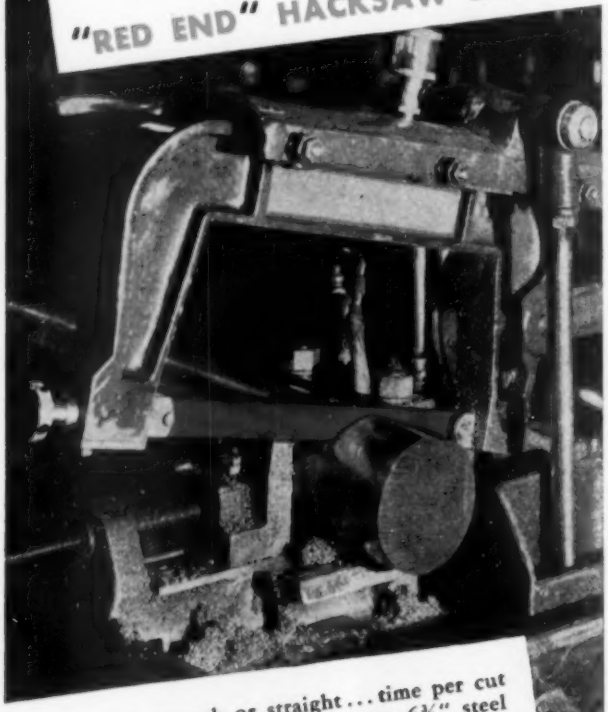
SPECIAL MACHINERY
THE VULCAN TOOL COMPANY
THE purpose of this brochure is to interpret the functions of special tool organizations in the world of tomorrow. It will also acquaint you with a particular organization which is pioneering the way toward higher standards of service to manufacturers who are themselves pioneering better methods and better products in their own fields of endeavor. It will help you to visualize a service which may exactly fit your present or future needs and definitely contribute to your success not only through the products and services supplied but also as a result of the ideas contributed and the point of view from which the service to you is approached.
WRITE FOR THIS BOOK
NORTH RECKEL STREET
DAYTON, OHIO

They Saved 15 Minutes Per Cut with Precision-Tensioned SIMONDS "RED END" HACKSAW BLADES



Cuts weren't smooth or straight . . . time per cut was 27 minutes and 15 seconds on 6¾" steel rounds . . . when the Simonds Cutting Engineer was called into this war plant to examine the job. After the correct blade-tension was determined by Simonds' new method, it was possible to double the feed. *Result:* Time per cut shortened 50% . . . and each cut straight and smooth, without ladder-marks.

Such results, of course, are not possible in every case. But in a majority of cases, *some* worthwhile improvement or saving results when a Simonds engineer gets a look at the cutting operation . . . no matter whether it's on metal, wood, or other materials. And there's no obligation. Just tell your Industrial Supply Distributor or Dealer to bring the Simonds man to *your* plant.

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PRODUCTION TOOLS FOR CUTTING METAL, WOOD, PAPER, PLASTICS

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SIMONDS SAW AND STEEL COMPANY
FITCHBURG, MASSACHUSETTS

NEW! the Porter - Cable BENCH BELT GRINDER

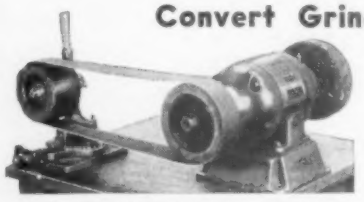
for faster, smoother grinding

Replaces Grinding Wheels and Set-Up Wheels

- Gives Superior Finish
- Line Contact Grinding PLUS
- Runs Cooler
- Moveable platen for 2-way operation

The BENCH BELT GRINDER is the answer to a hundred needs. Use it as a clean-up machine alongside the miller, shaper, automatics, hacksaw, or shear. It will remove burrs, cutter or tool marks with speed and smoothness. Use it for polishing, grinding irregular shapes, breaking sharp corners, or removing stock. Use it in the gear-cutting department where it will whisk off a burr in an instant. Use it to touch up tools for the set-up men. Use it in the assembly department for fitting parts. Use it in the tool room for reducing stock, grinding flats, making and repairing jigs, or sharpening tools. There are places for the PORTER-CABLE BENCH BELT GRINDER in every department of the plant. Investigate now—delay in installing this "tool of a hundred uses" means lost efficiency on every job.

Convert Grinding Wheels to Smooth, Cool, Clean-Cutting BELT GRINDING



Every production department, repair shop and general machine shop can profitably use abrasive belt grinding by converting old, inefficient methods with the *new* PORTER-CABLE BACK STAND IDLER.

- Write for complete information on these machines which can step up production all the way down the line. We'll send you, too, a book on Belt Surfacing—the method that is revolutionizing many machining and finishing operations.

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66% Saved on Production Cost Using *Speed Treat Plate* and Simple Heat-Treatment!

A large plastics molding firm replaced high alloy steel with *Speed Treat* medium high carbon hot rolled open hearth steel plate for the compression mold die shown.

Costing *less than a third* of the steel it replaced, *Speed Treat Steel* proved easier to machine and has turned out over one-half million molded parts with no appreciable wear and no signs of fatigue or breakage in the inside walls of the die which are only .350" thick. In operation, a pressure of 60-tons is exerted on the mold.

Size and weight of the mold were also reduced—an important factor since it is handled by women.

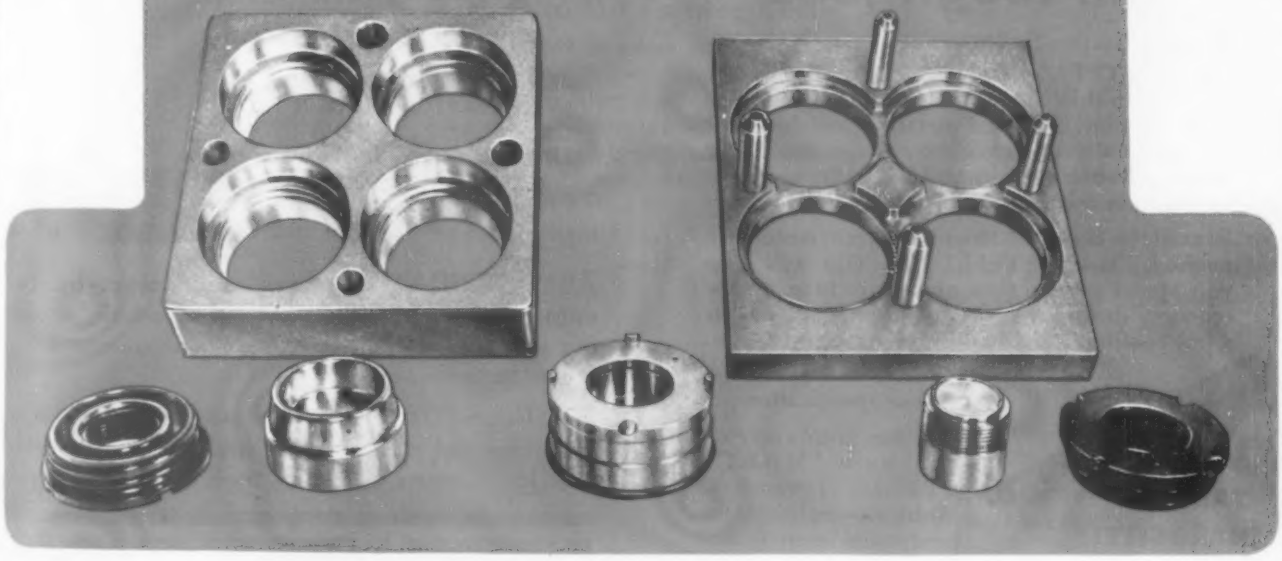
A uniform case $\frac{1}{16}$" deep was developed by pack carburizing. Starting with a carbon content of 0.49%, drillings showed the case had an average carbon content of 1%, varying from 1.13% on the surface down to .95% at a depth of 1/16".

After carburizing, hardening was accomplished by heating in controlled atmosphere to 1500° F., followed by an oil quench. A test showed a surface hardness of 62 Rockwell "C" had been developed.

SPEED TREAT Plate Provides.....

- Better Finish
- Lower Machining and Tooling Cost
- Ideal Response to Heat Treatment
- Negligible Heat Treat Distortion
- Reduced Weight
- As Much As 66% Lower Material Cost
- Savings in Production Time
- Lowest Ultimate Cost.

The high surface hardness, exceptional tensional strength and body toughness so readily produced with the simple heat treating procedure outlined renders this unusual steel practical for use where high carbon steels and other costlier steels were formerly thought necessary. The economical advantages of *Speed Treat* warrant its consideration for your postwar dies, shoes and molds; wear, surface and bolster plates; gears and sprockets, machine ways and numerous other parts, many of which are pictured in Catalog 1243, sent on request.



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Speed Case-Speed Treat Plate Division
Hammond, Indiana
"Established 1856"
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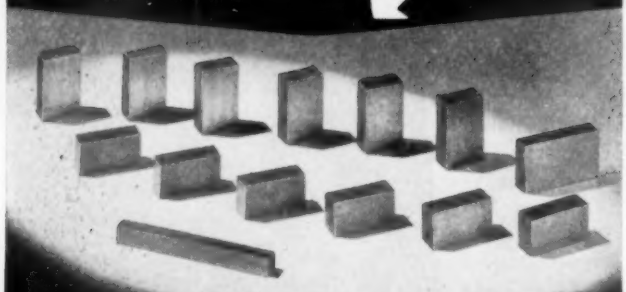

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Save money and machine time on the tough jobs

"HARDSTEEL"—the metal that has made it possible to drill steels hardened by any process without annealing—the metal in tool bits that has set new production records for machining tough and abrasive steels and other alloys—is now available in accurately ground tool tips.

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Made any size to your specifications.

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TAKE A "HARDSTEEL" DRILL *from the Toolroom Every Time You Need to Drill Hardened Steel.*

Sizes to 1-inch.

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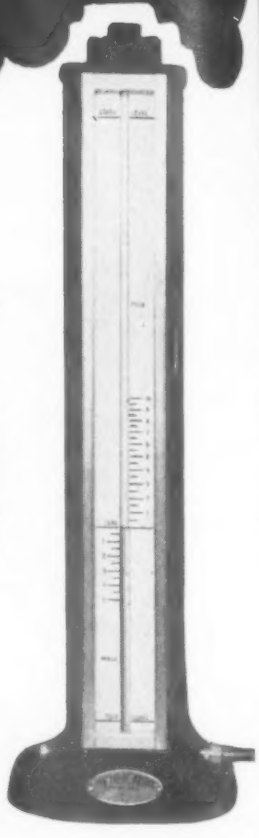

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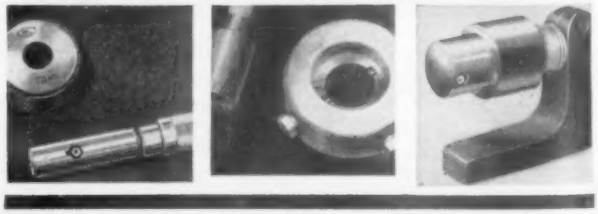
SEE THE METRICATOR IN OPERATION IN YOUR OWN PLANT . . . SOLVING YOUR TOUGHEST GAGING PROBLEM.

All METRICATOR gages are custom-built—engineered to meet your specific needs, assuring you of greater adaptability and guaranteeing precision accuracy.

METRICATOR gages eliminate human element variations and maintain their high degree of accuracy for a longer period of time in spite of wear.



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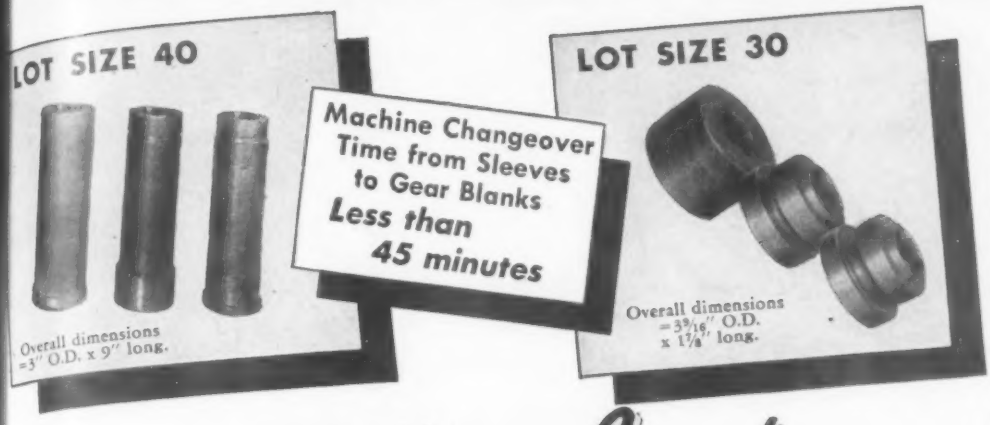
Metrical Laboratories, Inc.
ANN ARBOR, MICHIGAN

How to Save Time by Using Multiple Tooling on Turning Jobs Like These...


LOT SIZE 40
Overall dimensions
=3" O.D. x 9" long.
Machine Changeover Time from Sleeves to Gear Blanks Less than 45 minutes
LOT SIZE 30
Overall dimensions
=3 5/16" O.D.
x 1 7/8" long.

A TOTAL OF 59 Hours Saved ON THESE 2 LOTS

An automatic lathe, designed for quick and easy set-up, can handle jobs like these profitably. The Sundstrand is such a lathe. For instance, on the cast-iron sleeve shown to the left, the turning time has been reduced from one hour and fifteen minutes to eight minutes—43 out of 50 hours are saved on the lot of 40 sleeves. On the cluster gears, turning time was cut from 45 to 10 minutes on a lot size of 30 gears—16 out of every 22½ hours are saved.

These are typical of the savings coming from Sundstrand Automatic Lathes on short-run work. Simplicity of set-up and quick changeover make it possible to turn both long and small lot work profitably.

Naturally, the number of tools to be changed will affect the total changeover time on any lathe. However, the unique cycle control mechanism of the Sundstrand Automatic Lathe is so simple and easy to adjust that changing from one job to another, seldom requires more than 45 minutes.

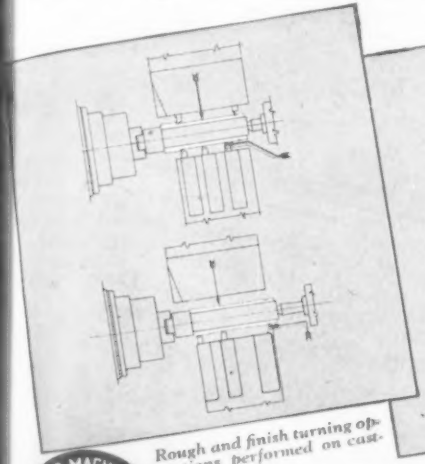
It will pay you to look into the time-saving features of this lathe. Write for the booklet illustrated and described elsewhere on this page.

Here are the Additional Features for Both Long and Short-run Turning...

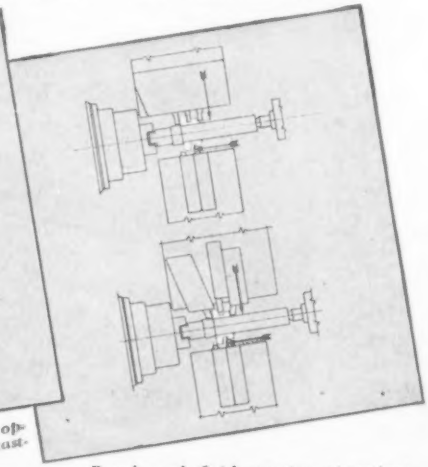
Sundstrand Lathes are made in three different models, offering a good selection to cover a wide range of sizes. Each machine can be supplied with two or three tool heads. One operator can often attend two or more lathes with plenty of time for gaging and checking work. Be sure to look into the advantages of Sundstrand Automatic Lathes before purchasing equipment for *any* turning jobs.

How to Cut Turning Costs...

This free 44-page booklet contains helpful tips on processing turning jobs, together with illustrations and tooling diagrams. Complete engineering and production data are given on many jobs similar to yours. Write for your free copy today. Ask for Bulletin 831.



Rough and finish turning operations performed on cast-iron sleeve.



Rough and finish turning operations performed on cluster gear blanks.

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ARMY NAVY

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THE HENRY G. THOMPSON & SON CO.
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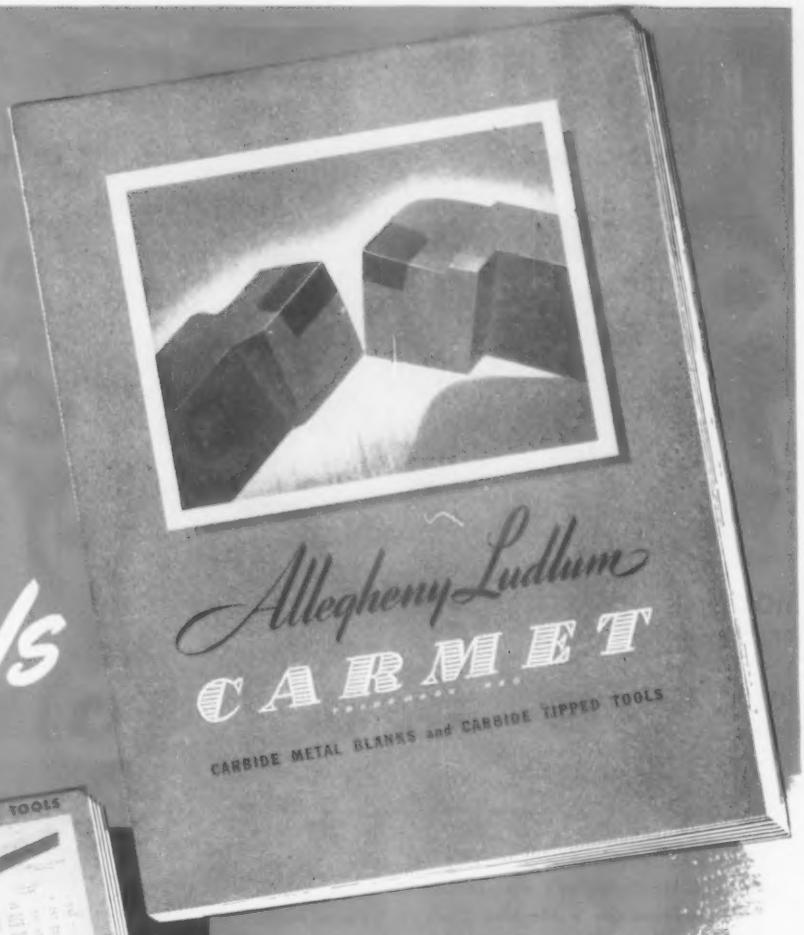

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OUR research work has always been strongly identified with cutting materials. With the various high-tungsten types of High Speed Steels as the starting point, followed by the development of the "moly" types, Allegheny Ludlum technicians later originated the patented DBL low-tungsten analysis of High Speed Steel, which has played a major role in wartime tungsten conservation.

Years earlier, our Laboratories did much basic development work on carbides, when they were first introduced in this country. At that time, we registered the trademark "Carmet." Now, with the re-establishment of our Carbide Manufacturing Division, an advanced and complete line of Carmet carbide-tipped tools and carbide metal blanks is available, thoroughly researched and effectively enhancing Allegheny Ludlum's service to users of cutting materials. We invite your attention and inquiries.

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STEEL FOR THE NATION'S WELFARE

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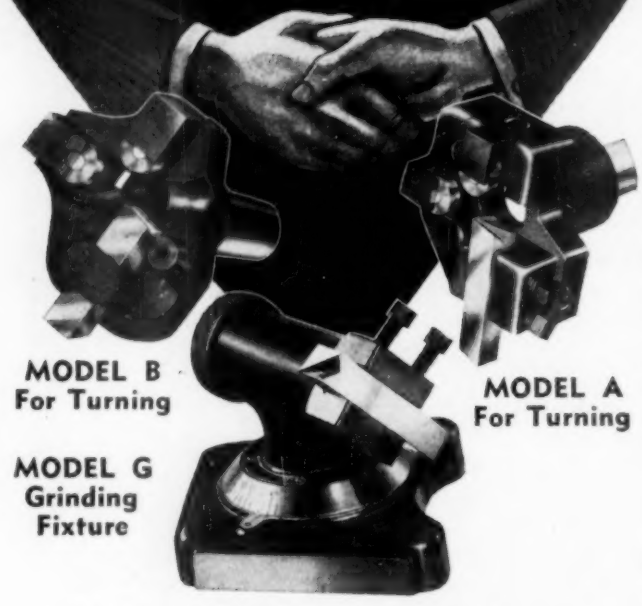
BRACKENRIDGE, PENNSYLVANIA

W&D 9497

THEY GO HAND IN HAND for INCREASED Screw Machine Production



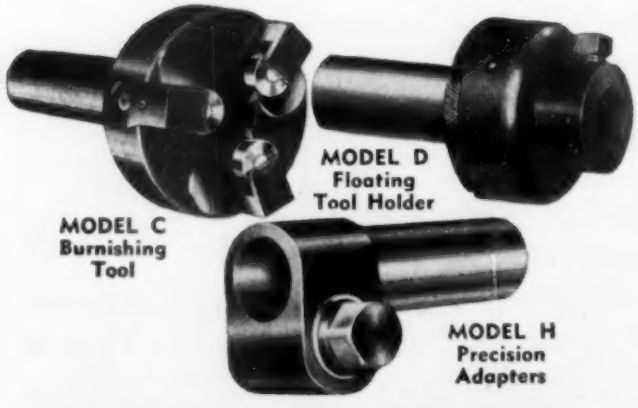
Boyar-Schultz experience in making fine tools, and their thorough knowledge of the screw machine's possibilities, have produced Screw Machine Tools that assure higher quality workmanship as well as increased screw machine production.

Turning Tools—Model A and Model B, are built with sturdiness that assures close tolerance work. Adjustments are quickly made and positive.

Model G Universal Grinding Fixture saves time in grinding tool bits to correct clearance angles for maximum efficiency. Uniform grinding—no guess work—saves time and tool steel.

Other Boyar-Schultz Tools that step-up screw machine quality and production include, Burnishing Tool, Floating Tool Holders and Precision Adapters.

Write for Circulars Describing These Tools



BOYAR-SCHULTZ CORPORATION

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Output Increased with TUBULAR RIVETS

Don't use solid rivets — use tubular rivets with Chicago Automatic Rivet Setters, because tubular rivets with Chicago equipment speed up production and lower unit costs. Get all the facts, especially on your war products. Even though small solid rivets are specified, send us sample assemblies so that we can fasten them with proper tubular rivets and give you a production schedule. Then submit the tubular riveted assembly for governmental approval and you will invariably receive an O.K.

A typical fast operating machine that automatically feeds, inserts and clinches a tubular or split rivet with each pedal operation. Other machines available for setting up to 4 rivets at a time—bench and pedal types.

Chicago Rivet AND MACHINE CO.

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TUBULAR AND SPLIT RIVETS IN ALL RIVET METALS

Rubber & Abrasive
WORK TOGETHER for
Faster, Better

BURRING, FINISHING, POLISHING

Brightboy's combination of rubber and abrasive in exact "balance", simultaneously burrs, finishes, polishes; saves time, improves close-tolerance work.

Ask your distributor to tell you how Brightboy can fit into your present and post-war production. Get Brightboy samples, prices, production data—and assistance from Brightboy field men, always at your service.

BRIGHTBOY INDUSTRIAL DIVISION
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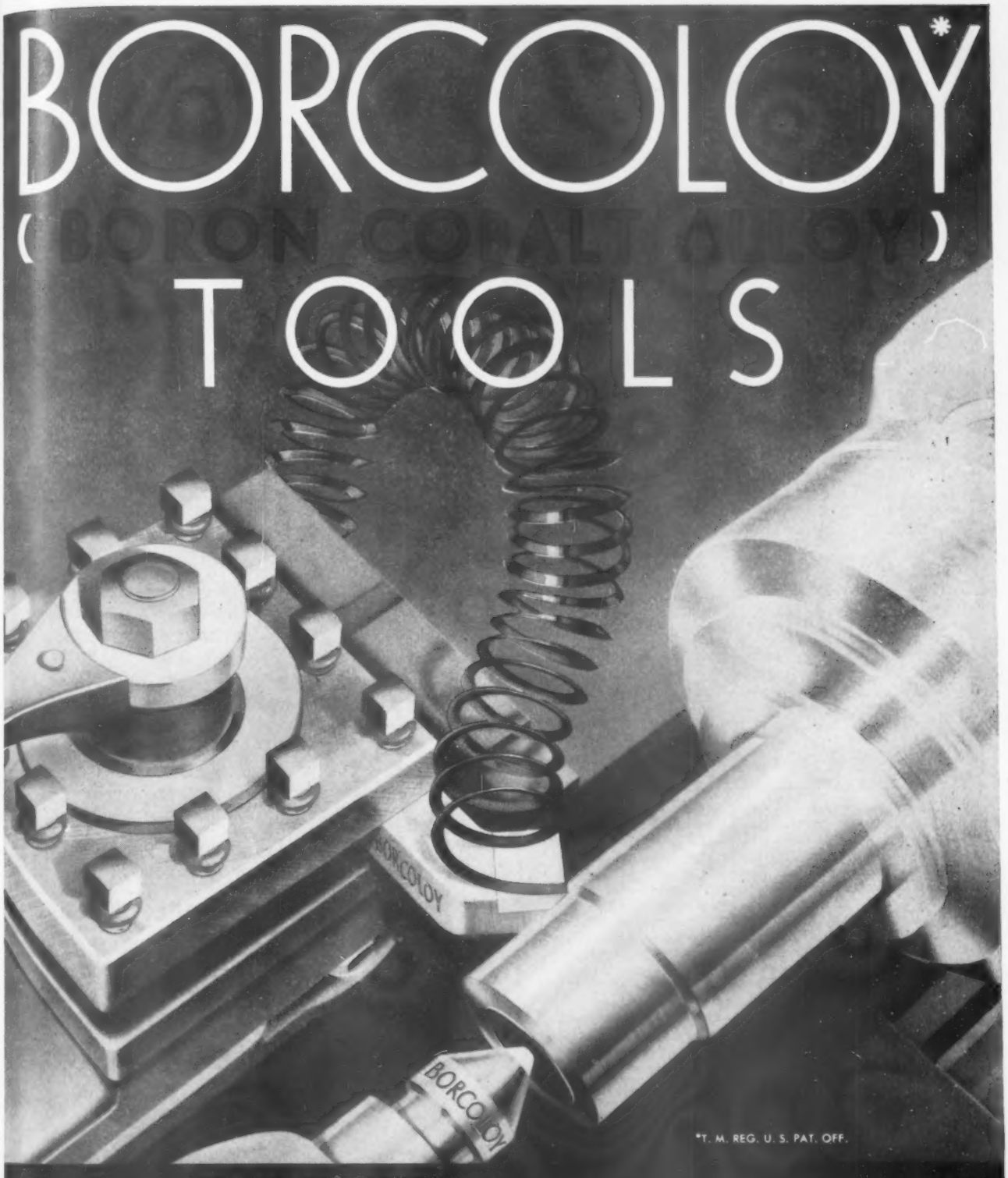
BORCOLOY*
(BORON COBALT ALLOY)
TOOLS



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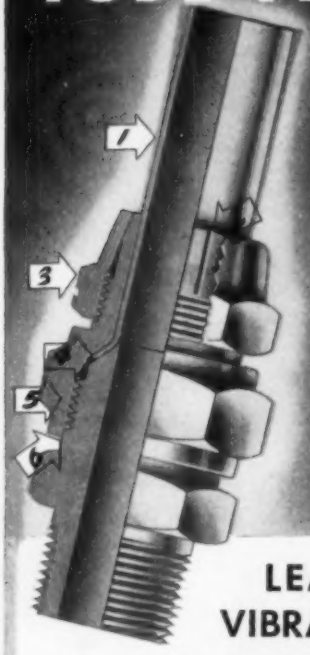
A NEW, SUPER HIGH-SPEED, TOOL STEEL WITH, (1) ALL THE DISTINCTIVE FEATURES OF "CENTRIFUGALLY CAST" ALLOYS, (2) HIGH WEAR RESISTANCE DUE TO THE PRESENCE OF BORON AND (3) A MAXIMUM RED HARDNESS IMPARTED BY TWENTY PERCENT COBALT

GENERAL AIRCRAFT EQUIPMENT, INC.

STRONGER
THAN THE TUBING ITSELF
COLLET GRIP
Seals as it grips
TUBE FITTINGS



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2 SLOTTED collet insures uniform grip of tubing surface, protecting flare seal.

3 COMPRESSION NUT compresses Collet Nut to tube, forming permanent collet grip that cannot loosen.

4 DESIGN directs pulling stresses and vibration strains away from angle of flare.

5 COLLET NUT has long bearing surface which grips tube securely beyond the flare.

6 Easy to assemble and disassemble. Use repeatedly.

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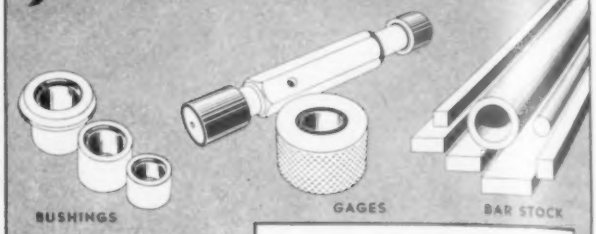
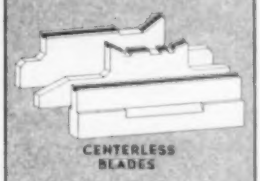
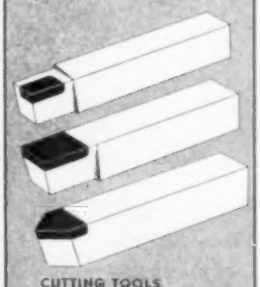
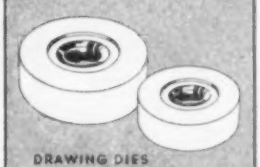
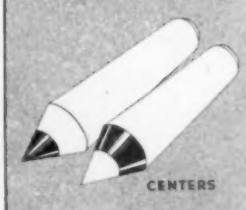



CENTERLESS BLADES


CUTTING TOOLS


DRAWING DIES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DIAMOND DRESSERS

TALIDE METAL

. . . is a superior grade of Tungsten Carbide—developed by us during the past twelve years and manufactured today by precision methods under rigid control. It has exceptional density, strength and hardness and is ideal for application at wear points on tools, machinery and equipment. Talide Metal bar stock is available in any size, diameter and length.

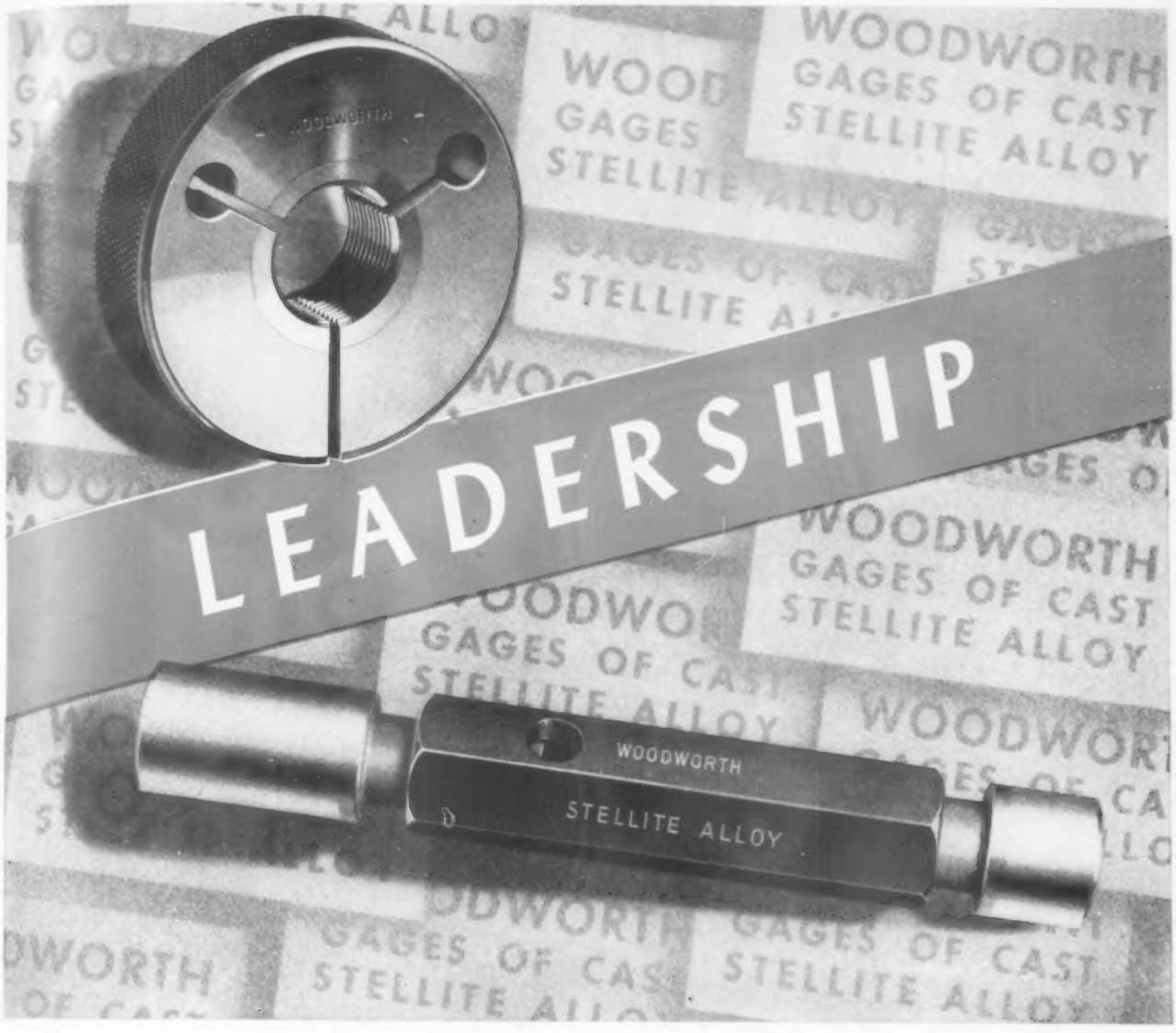
The use of Talide Metal in your plant will assure you of constant, uninterrupted production with the added advantages of . . .

★ Longer Life
★ Increased Output
★ Maintained Size
★ Closer Tolerance
★ Fewer Rejects

Thousands of Talide-Tipped Tools, Dies and Wear Resistant Parts are shipped daily all over the country to Arsenals and War Plants producing cartridge cases, small arms ammunition, primer cups, airplanes, tanks, ships, rifles, machine guns and other war material.

TIPPED WITH TALIDE TUNGSTEN CARBIDE

METAL CARBIDES CORPORATION
YOUNGSTOWN, 5 OHIO
TUNGSTEN CARBIDE TOOLS . DIES . WEAR PARTS



From the day of their introduction to industry, gages of Cast Stellite Alloy by Woodworth have been earmarked for leadership. Today these tough, highly wear-resistant gages have attained leadership . . . through superiority *proved* in the service of industry.

Gages of Cast Stellite Alloy by Woodworth have a service life many times that of steel . . . gage life is increased up to 25 times. They are non-corrodible and non-magnetic, have a low co-efficient of friction, low affinity for other materials and a co-efficient of expansion close to steel.

Gages of Cast Stellite Alloy by Woodworth will remain accurate much longer than those made from any of 18 other materials tested.

Write for descriptive Folder No. 44-S.

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WOODWORTH

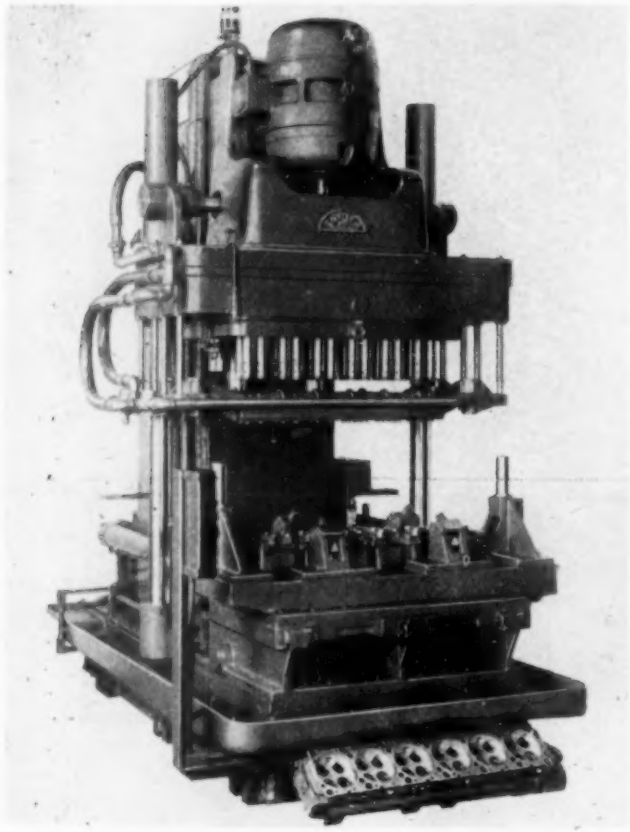
N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • PRECISION MACHINED PARTS

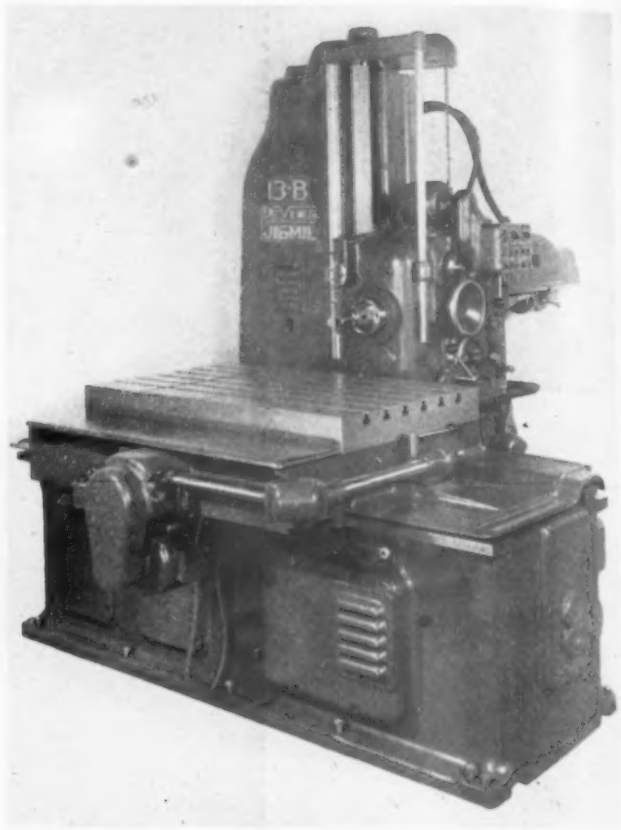
NEW EQUIPMENT

• Materials + Processing •

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY



Special machine drills and reams 24 holes



Refinements add to boring and milling machine

ALUMINUM ALLOY HEAD REQUIRES SPECIAL MACHINE (Q50)

Simultaneous drilling and reaming 24 holes in an Aluminum alloy aircraft cylinder head required a special machine. It was built by Snyder Tool & Engineering Company.

The machine consists of a standard drilling machine column installed on a special base and using a special multiple head mounting bracket, carrying a 48-spindle multiple drilling head and two 24-hole bushing plates. All spindles are ball-bearing mounted.

Part of the operation is precision reaming requiring two vertical guide bars extending from fixture base to head casting. Rack teeth in these bars engage a pinion cross shaft and keep both ends of the head moving downward in parallel.

Work is located on dowels and manually clamped. All operations—drilling, moving from drilling to reaming position, reaming and returning to loading position—are automatic after the cycle starter button is pressed.

In case of tool trouble, an emergency return button retracts tools from work and the fixture automatically returns to loading position.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

DESIGN IMPROVES TOOL POST TURRET AID TO LATHES (Q51)

An improvement to tool post turret design is announced by Crozier Machine Tool Company. The turret was first made for bench lathes and now has been adapted for cutting-off operations.

One side of the block is channeled to receive a standard beveled section cut-off blade, which is supported at the top by a hardened channeled bar, which provides maximum bearing surface for the locking bolts, thus quickly and positively centering and holding the blade in position.

This arrangement assures perfect rigidity, materially reduces set-up time and increases production by chatterless operation. The turret retains its normal advantages of fast, close indexing, accuracy and long life, builders say.

For small, medium or large lathes.

ALTERED DESIGN UPS PRODUCTION, ACCURACY (Q52)

Greatly increased accuracy and speed of manipulation is claimed for Model 3-B boring and milling machine as result of design changes, DeVleig Machine Company reports. In basic design the machine follows its predecessor, but it has been refined, some range dimensions extended and important fundamental features added.

An automatic positioner is among improvements. Ordinary skill will position table and spindle within .0001" accuracy, in response to precision and measuring rods and push buttons. Another accuracy feature is the feather touch controlled pressure locking. The automatic table retraction feature has been improved through push button control.

The machine has 24 spindle speeds from 22 to 1200 RPM. Bar feeds are in thousandths per revolution from .001 to .016". Milling feeds to the table and the head are in inches per minute selected with a dial quick change mechanism providing a range from .3 to 15" per minute.

Machine weight is 20,000 pounds.

(Continued on page 166)

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Request the information and service you desire and keep your library up-to-date . . .

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THREE FREE SERVICES without obligation

For your convenience these three business reply cards enable you to request quickly

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When answering advertisements, specific information on problems or company representative's call.

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Simply fill out the card, indicating the information or service you desire, and mail.

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In answering an advertisement, include the name of the advertiser and indicate by a cross if literature is desired or if company representative should call. No stamp is required.

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USE THIS CARD

for requesting new catalogs and bulletins listed in this issue.

2

USE THIS CARD

for requesting additional information or bulletins about new equipment, materials, processes, etc.

3

USE THIS CARD

when answering advertisements, to obtain specific information on problems, or when you desire a company representative to call.

Write in square, number of item describing one catalog wanted ➔ ☐

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2

Request for additional information and catalogs covering
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MATERIALS
PROCESSES

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REPRESENTATIVE
TO CALL

NORTON ABRASIVES

OIL STONING
PAYS TREMENDOUSLY

"I remember one job where we were testing cut-off blades made of various types of steel and could find but approximately 20% difference in production with the tools made of the different steels. However, when we stoned the cutting edges of an 18-4-1 steel tool, a 700% increase in production resulted, with improved finish on the part."

That's a written statement by the engineer in charge of small tools in a famous airplane engine plant. And mind you, he was not testing out "hand stoned edges," but the virtues of various tool steels, when he made his startling discovery.

Can you afford to neglect investigating what hand stoned edges will do in your tool room?

The stones he used are illustrated: an "India" Round Edge Slip (Medium) listing at 50¢, followed up for supreme finish by a similar shape in "Hard Arkansas" at $1.00, both good for years of like economies.

BEHR-MANNING • TROY, N. Y.

(DIVISION OF NORTON COMPANY)

ALSO RELIABLE COATED ABRASIVES SINCE 1872

MACHINE DOES THREE JOBS WITH EACH STROKE (Q53)

Tomkins-Johnson Company has perfected an electrically-powered machine especially adapted to the operations of piercing, dimpling and riveting bail ears on pails, using 1-¾ lb. tinners rivets. All three operations are accomplished with a single down stroke.

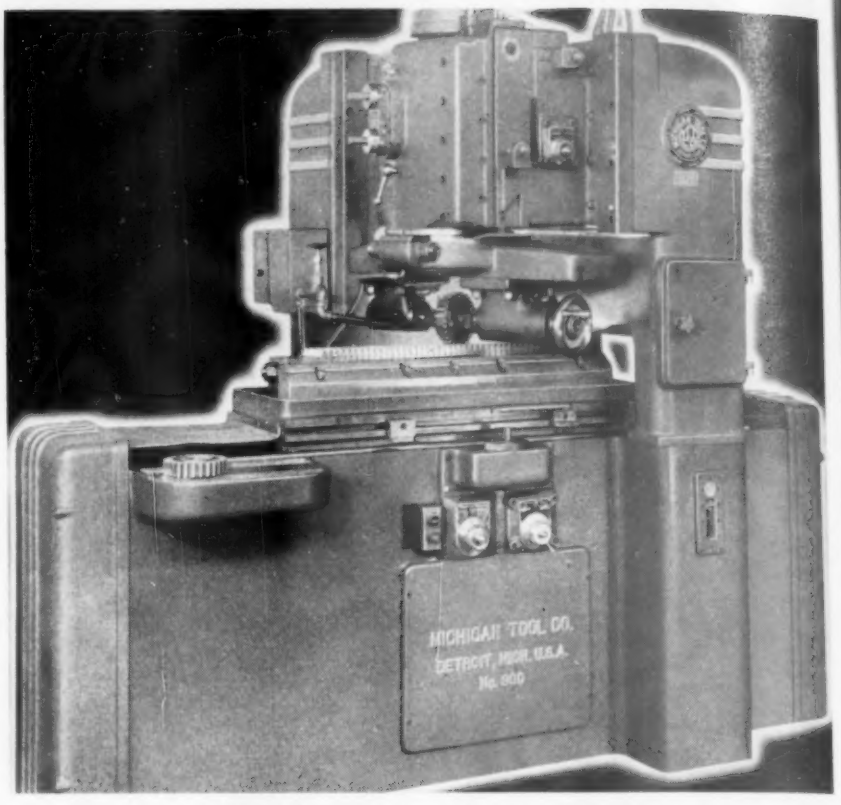
When ram descends on unpierced pail, a combination piercing and dimpling die mounted on a spring-actuated pressure pad attached to the ram, forces the work over the rivet, piercing and forming a dimple in the pail.

POWDER METAL MOLDING EASY WITH NEWEST PRESS (Q54)

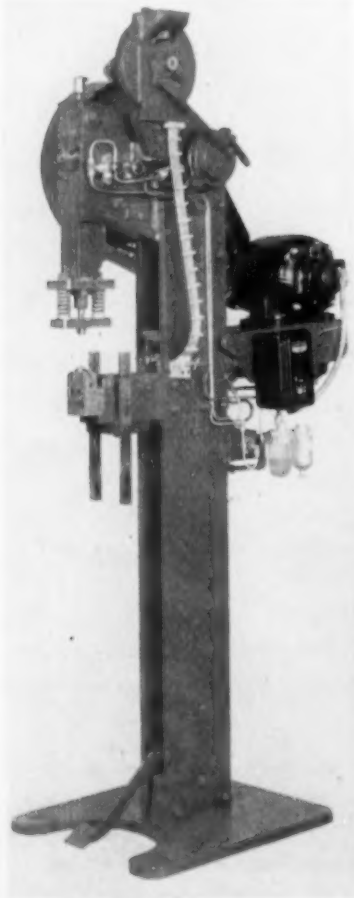
Briquetting of parts from powdered metal has been simplified through a new hydraulic press developed by Watson-Stillman Company. Consistently uniform structures and accuracy in finished parts is claimed.

The press has a 400-ton vertical ram and a 300-ton horizontal ram. The double-acting machine has controls conveniently located for operators. Continuous performance and exact duplications are assured by smooth, pulsation pressure application, accurate pressure adjustment and automatic cycle controls.

Mold size is 6" x 7" x 30". Working parts are inclosed in dust-proof housings. Pressures are supplied by a radial piston-pump driven by a 30 HP motor.



Gear finishing machine has postwar design features



Speedy Riveter

Molds Powdered Metals

CROSSED AXIS MACHINE WIDELY USED IN INDUSTRY (Q55)

Moving to keep war industry abreast of advances, Michigan Tool Company announces an improved "postwar" line of rack-type, crossed-axis gear finishing machines. These machines are widely used in military automotive and aircraft industries. Latest announcement is on the 900 series.

Completely hydraulic in operation the machine incorporates systems for table and head feed. Lubricants and coolants have separate outlets, reducing possibility of contamination.

Improvements have also been made in control system for holding extremely fine tolerances. Electrical controls have been improved for safety and wearability.

Series 900 is designed to handle gears up to 8" diameter with 18½" between centers, maximum length.

STELLITE GAGES SHOW SMALL WEAR CHARACTERISTIC (Q56)

Studies conducted by Cadillac Gage Company indicate their Stellite thread plug gages consistently outwear steel gages five to 20 times. Economies up to 85 per cent are claimed for the substance, tested on materials of varying abrasive qualities. Stellite is a cobalt—tungsten-chromium alloy.

(Continued on page 168)

INFORMATION FREE

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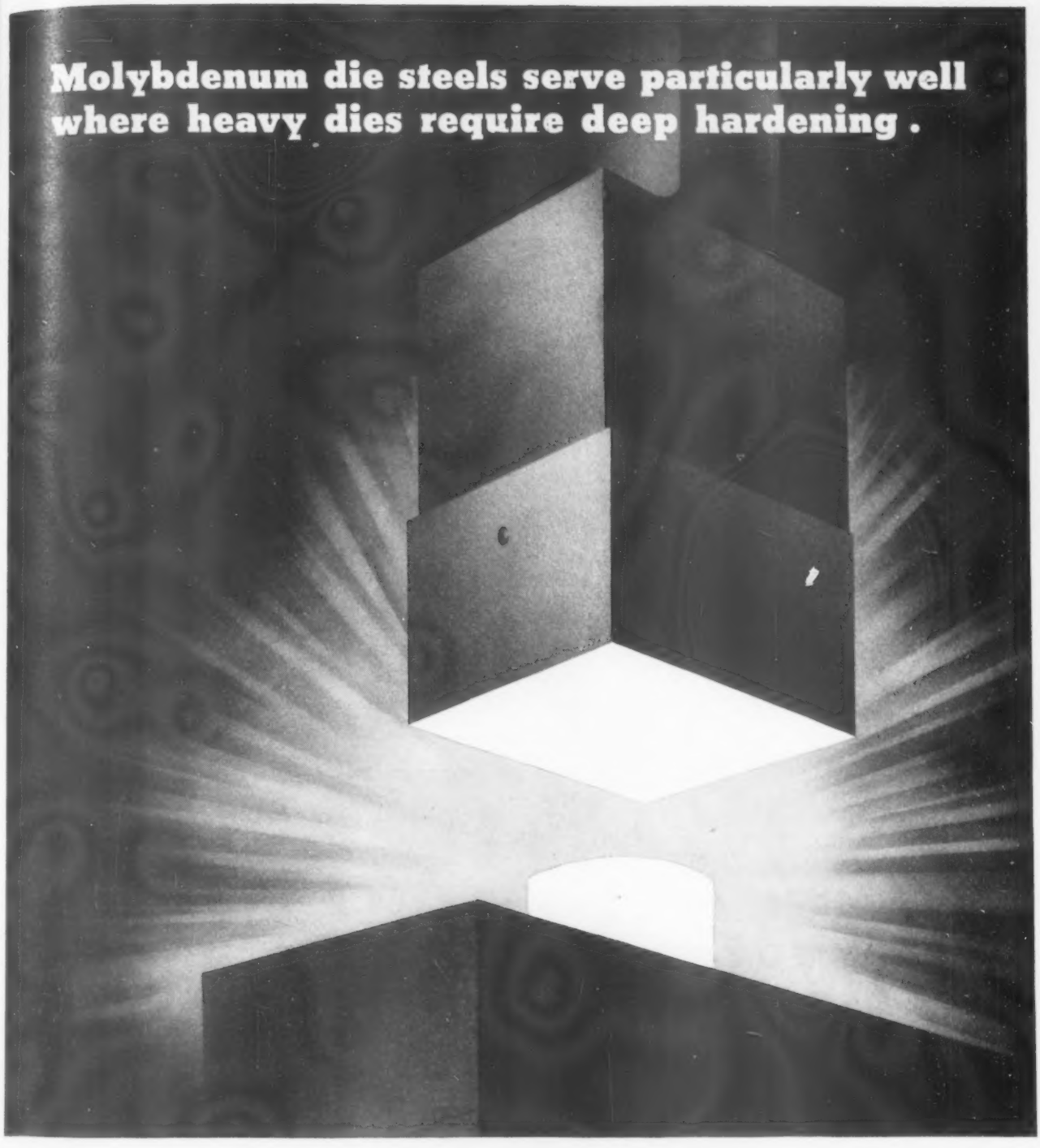
Molybdenum die steels serve particularly well where heavy dies require deep hardening.



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

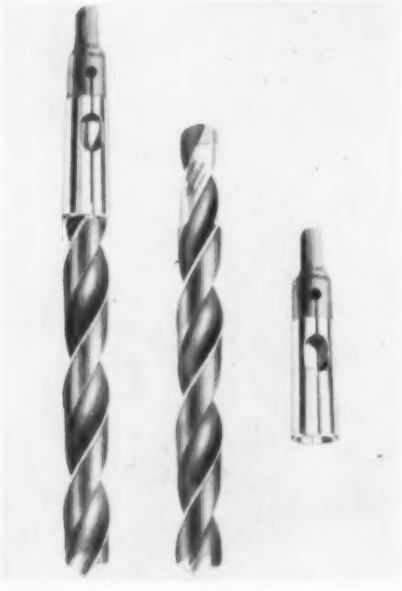
Climax Molybdenum Company

500 Fifth Avenue · New York City

MOLY

SHANKLESS DRILL MAKES NEWS IN NATION'S INDUSTRY (Q57)

Something new has been added in twist drills after 75 years of conventional design. A development of Ford Motor Company has been made available to industry generally in the form of SHANKLESS twist drills through Republic Drill & Tool Company. By use of a drill driver, the SHANKLESS drill becomes a less expensive and more versatile tool.



New design for drills

Among advantages claimed are substantially lower purchase costs, 25 to 40 percent more usable flutes, a tougher and stronger drill because of roll-forging, heavier web and a special heat treat shock absorber structure in the neck. Seven driver sizes will handle 135 drill sizes from ¼" through 2".

Two minor disadvantages are admitted: necessity of thinning web when sharpening drills and necessity of stocking drill drivers. However, it is pointed out, that these objections are far outweighed by the SHANKLESS drill's many advantages. Scully-Jones and J. C. Glenzer announce they will produce drivers for SHANKLESS drills.

MAGNETIC MOTOR STARTER PROTECTS FROM OVERLOADING (Q58)

A new magnetic, reduced voltage cage motor starter, which protects motors from sustained overloads, single-phasing, locked rotor conditions and overloading from too frequent starting, is announced by Allis-Chalmers Manufacturing Company. It is available for control of motors from 5 to 2500 horsepower, up to 5000 volts, three phase, 50 or 60 cycles.

INFORMATION FREE

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Handy bench tool

BENCH TOOL DELIVERS 8000 POUNDS PER STROKE (Q59)

Pressures from 300 to 8000 pounds are delivered from a new bench machine developed by Denison Engineering Company. The machine will deliver the rated pressures in single, or repeated up and down strokes.

The device is basically an oil hydraulic press capable of four tons down pressure and up to 5000 pounds "pull

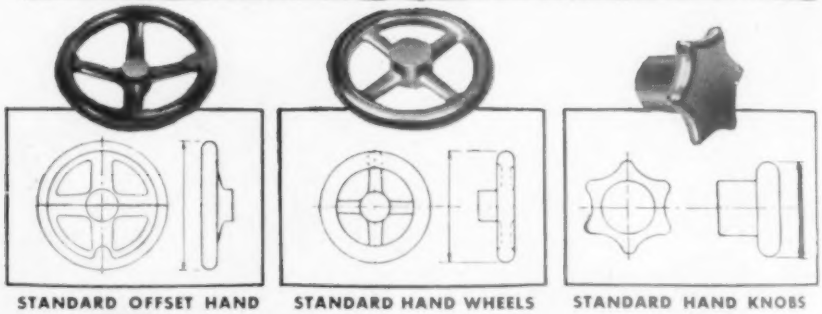
(Continued on page 170)

Now!

READY FOR USE

No need to design or make these important machine accessories—here they are ready to meet your requirements—in all popular standard sizes. Send for complete catalog of dimensions and prices.

CAST IRON WHEELS and KNOBS

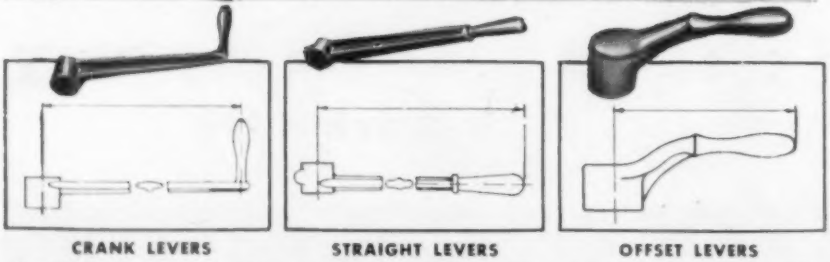


STANDARD OFFSET HAND WHEELS
Diameter sizes: 4, 6, 8, 10, 12, 15, 20, 26

STANDARD HAND WHEELS
Diameter sizes: 4, 5, 6, 7, 8, 9, 10, 11, 12, 14

STANDARD HAND KNOBS
Outside diameter sizes: 1½, 2, 2¾, 3½

and MALLEABLE IRON LEVERS



CRANK LEVERS
Lengths: 4, 6, 8, 10, 12, 16

STRAIGHT LEVERS
Lengths: 10, 12, 16, 20, 24, 30

OFFSET LEVERS
Lengths: 3⅞, 4½, 5, 5¾

Any item machined to specification on request

MACHINE PRODUCTS CORPORATION
6771 McNichols Road East
Detroit 12, Michigan

"WITH Gulf Cut-Aid

WE INCREASED PRODUCTION ON THIS MILLER **10%**

——TOOL LIFE **50%**

—says this Superintendent

(Left) Close-up of straddle milling operation on fins for impellers of geared aircraft superchargers. Tolerance on the sides of the fins is critical as to finish and dimensions. (Right) Actual photo of a Gulf Service Engineer consulting with Superintendent on results secured with Gulf Cut-Aid on this precision machining job.

GULF CUT-AID PROVED SUPERIOR to 12 other brands of cutting oil we tested for straddle milling aluminum alloy supercharger impellers," says this Superintendent. "With this revolutionary new cutting oil, we get 10% greater production and 50% longer tool life than with the cutting fluid we used previously."

This is one of hundreds of war plants that have increased production and tool life on precision work by using the proper Gulf Cutting Oil for each particular job requirement.

Gulf performance-proven cutting oils have established records on the toughest steels and most punishing schedules that the armament and aircraft industries offer. You'll find them helpful in improving production and tool life now and in paring costs below competitive levels in the postwar period.

Let a Gulf Service Engineer show you why Gulf Cutting Oils are ideal for many of your machining jobs. Write, wire, or phone your nearest Gulf office today.

GULF INDUSTRIAL LUBRICATION

GULF OIL CORPORATION · GULF REFINING COMPANY

Division Sales Offices:

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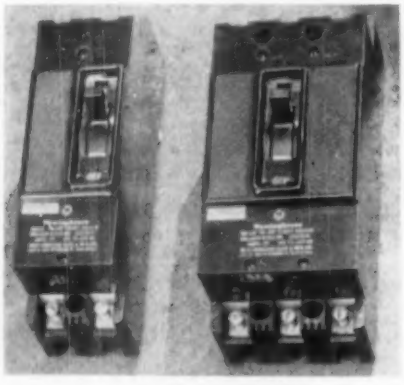
New Orleans · Houston · Louisville · Toledo

up" pressure. Manufacturer claims production operations of pelleting, peening, assembling, honing, broaching, burnishing and straightening are among uses already discovered for the tool.

The device operates from two hand controlled levers and can be moved slowly or faster as desired.

CIRCUIT BREAKER MAKES LIGHTER STRUCTURES EASIER (Q60)

Lighter structures for distribution panelboards, built-in applications and bus duct plug-ins are possible through



Compact circuit breaker

use of a new 100-ampere "De-ion" circuit breaker announced by Westinghouse Electric and Manufacturing Company.

All ratings are available in one compact breaker with uniform pole spacings and terminal arrangement, providing complete interchangeability between ratings.

Equipped with thermal and instantaneous magnetic trip elements, the fuseless circuit breaker permits maximum circuit loads and fast resumption of interrupted service. Silver alloy contacts reduce wattage loss through increased contact life. The alloy eliminates "freezing".

IMPROVED GRINDING GAGE OFFERS CONTINUOUS CHECKING (Q61)

An improved grinding gage, which continuously measures the diameter of external cylindrical jobs while work is in progress and automatically indicates the point at which the correct diameter is reached, is announced by the American Diamond Tool & Gage Company.

The gage is said to provide a continuous visible check on out of roundness and the amount of error. Perfect roundness and accuracy within .0001" is said to be easily maintained, even by semi-skilled operators.

The gage is adapted both to straight and tapered work. At no time of operation need the machine be stopped for hand calipering.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

COMPANY OFFERS GAGE FOR CHECKING COUNTERSINKS (Q62)

Dayton Rogers Manufacturing Company has devised a countersink gage for checking machine countersinks for

Dayton Rogers countersink gage

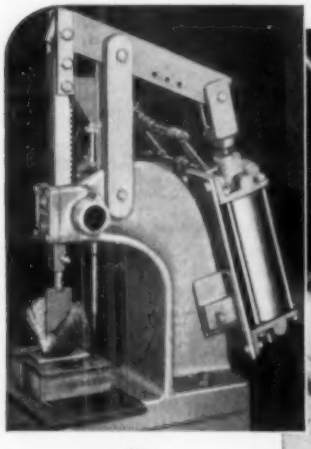
size and shape for grinding and sharpening, as well as the finished countersunk screw adaptors.

Five different countersink angles are included, including two gage view profiles in each instance. Gages are used as standard for both grinding and checking work. Offered free.

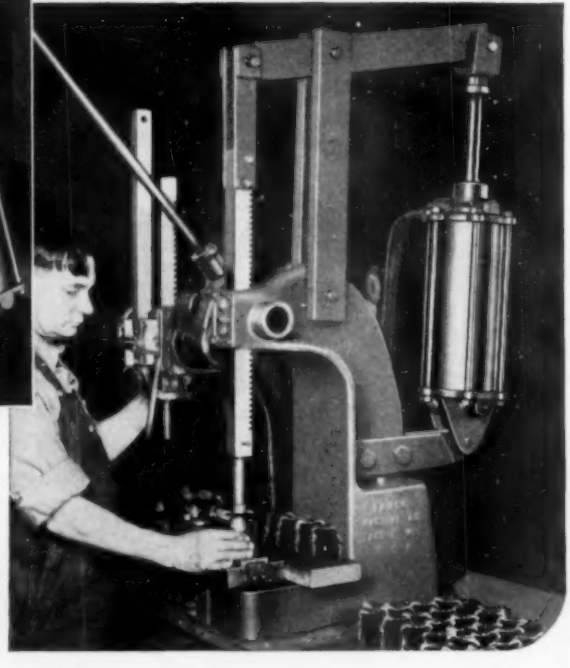
NEW DESIGN PROVIDES STURDIER DIVIDING HEAD (Q63)

Construction and material features improve the Ellis Double-Swivel Dividing Head, making it sturdier and stronger for extremely close tolerance

(Continued on page 172)



Small arbor press to crimp wire, powered by a small Model A NOPAK Cylinder mounted on hinged base.



Hand and air power both are used in this dual press equipped with 10" NOPAK Model E Cylinder.

Air Cylinders STEP-UP BRUSH PRODUCTION

With new machinery and experienced help hard-to-get . . . the war-time demand for circular wire brushes created a real problem for The Milwaukee Brush Mfg. Co. Modernization of existing equipment was the happy solution . . . increased production tenfold with only twice as many workers.

A vital step in this modernization was the application of air cylinder power to various types and sizes of arbor presses which perform many of the holding, clamping and squeezing operations in assembling these brushes. Altogether, nearly twenty machines were converted to air operation. Foot control valves leave the operators' hands free to manipulate tools, dies and parts for speedy assembly.

Perhaps some of your machines can be modernized through the application of air or hydraulic power. NOPAK Cylinder Bulletin 82 can help you decide. Write for it.

GALLAND-HENNING MFG. CO.
2757 S. 31st ST. MILWAUKEE, WIS.

NOPAK VALVES and CYLINDERS
DESIGNED for AIR or HYDRAULIC SERVICE

Representatives in Principal Cities

No. 1-14... 32"x9" table... 14" table travel... hydraulic table feed... full automatic cycle.

● When it comes to change-over for peacetime milling jobs... call on Kent-Owens! In production for war — these machines have performed at a terrific pace with top-dependability. Today — they are ready for important new assignments in production for peace. Rugged... simple... efficient... with practical features that appeal to experienced shop men. Write for latest bulletins. Kent-Owens Machine Company... Toledo, Ohio.

KENT-OWENS

Milling Machines

THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON
General Machinery Corp.
BUFFALO
Don W. Patterson
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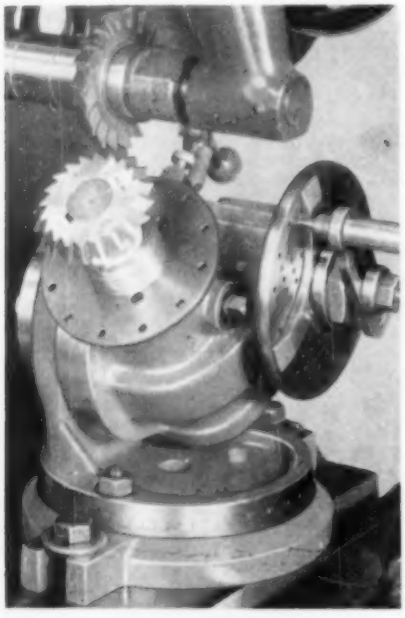
Neff, Kohlbusch & Bissell
DALLAS
Hamilton-Huster Mach'y Co.
DAYTON
Gosiger Mach'y Company
DETROIT
A. C. Haberkorn Mach'y Co.
GRAND RAPIDS
Joseph Monahan
HOUSTON
Oliver H. Van Horn Co., Inc.
INDIANAPOLIS
Oatis-Booth Machinery Co.
KANSAS CITY
Eichman Machinery Co.
LOS ANGELES
Eccles & Davies Mach'y Co.
Harron, Rickard, & McCone
MILWAUKEE
Neff, Kohlbusch & Bissell
MINNEAPOLIS
The Satterlee Company
MOLINE
John J. Normoyle Co.
MONTREAL
F. F. Barber Mach'y Co.
NEW ORLEANS
Oliver H. Van Horn Co., Inc.
NEW YORK
Harrington-Wilson-Brown Company
PHILADELPHIA
Calco Machinery Company
PITTSBURGH
Barney Machinery Company
ROCHESTER
F. W. Schiefer Machinery Co.
SAN FRANCISCO
C. F. Bulotti Machinery Co.
SEATTLE
Star Machinery Company
ST. LOUIS
Blackman & Nuetzel Mach'y Co.
Clarke Equipment Company
SYRACUSE
J. F. Owens Mach'y Company
TORONTO
F. F. Barber Mach'y Company
WALKERVILLE
F. F. Barber Mach'y Company

work. Other improvements include: extra blank index plate which may be drilled for special operations, ground worm and holddown bolts.

The Ellis has a 6½" to 11" capacity swing, standard 1¼" eight thread spindle ground to No. 9 B & S taper. The base is calibrated in degrees. Three index plates permit all numbers to 50, even numbers and multiples of five to 100 excepting 96, and others to 1000 and more. Complete revolution on the horizontal plane and 100° to the right and 60° to the left on vertical plane.

The Ellis converts any ordinary milling machine or tool grinder into a "universal" machine. Manufactured by Ellis-Lawyer Tool Company.

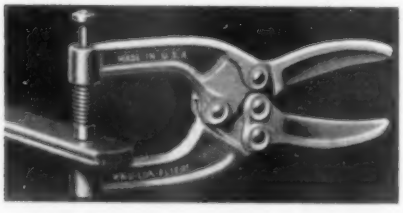


Improved dividing head

DETROIT COMPANY MAKES VARIABLE GRIP PLIER CLAMP (Q64)

A new improved plier, announced by Knu-Vise, Incorporated, introduces a useful feature in providing a self-setting pressure spindle to compensate for thickness variations of clamped parts.

The clamping plier was styled to meet industrial requirements.



Plier compensates for variations

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

New style snap gage

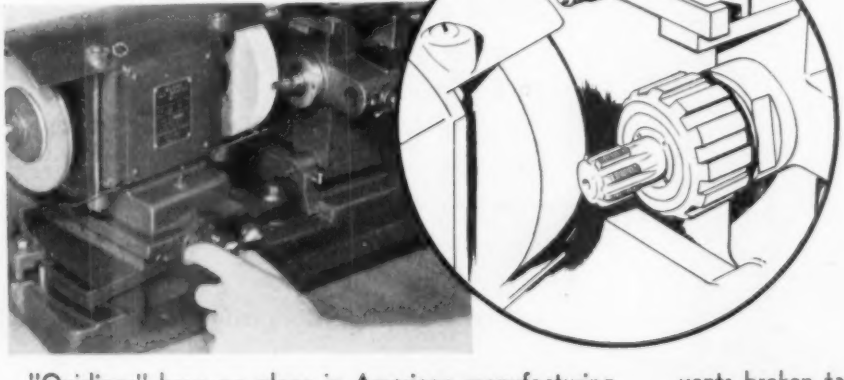
FEDERAL GAGE HAS RETRACTABLE ANVIL (Q65)

Federal Products Corporation announces a dial indicator type of snap gage to meet what they say is a trend toward gages by which the inspector can see rather than feel dimension variations. A design feature permits the weight of the gage and the operator's hand to rest upon a fixed contact.

Another advantage is that the lower anvil is retractable, permitting gaging contact without marring surfaces.

(Continued on page 174)

Model No. 1 for taps up to 6" long.
Model No. 2 for taps up to 14" long.



WORN TAPS ARE "Quislings"

KEEP TAPS SHARP ON A BLAKE TAP GRINDER

"Quislings" have no place in American manufacturing plants. Dull taps are "Quislings"—and there is one sure way to eliminate the delay and waste which they cause—sharpen taps on the Blake Tap Grinder. This is the best and most economical way to keep taps at top efficiency. The Blake method keeps taps at "original" sharpness, prevents broken taps, prevents spoiled work, reduces power consumption. Both the Model No. 1 and No. 2 will sharpen taps with 2, 3, 4, 5, 6, 8 and 10 flutes, both right- and left-hand. It will pay to get the full information in Bulletin 544—mail the coupon today.

No machine is better than the cutting edge of the tool it uses.

EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE.
NEWTON CENTRE 59, MASS.

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS

Please send me Bulletin 544 which gives complete details on Blake Tap Grinders. T.E.

Name..... Title.....
Company.....
Street.....
City..... State.....

(ACME PHOTO)

"LOGAN" VALVES

OPEN THE DOORS ON LST BOATS

Silent as ghosts, invisible in the blackness of the night, the L.S.T. boats stand off shore, awaiting the hour to strike. At the given signal, they will streak for the beach and push their noses into the sand, there to deliver their cargo of tanks, tractors, guns and other machines and materiel of war.

Dangerous in the extreme, these amphibian operations call for the ultimate in courage, presence of mind, and split-second timing. Above all else, success hinges on the smooth, faultless opening of the big prow doors—at exactly the right moment. Failure here would imperil the whole adventure.

Here at Logansport we are humbly and, we feel, justly proud that "Logan" hydraulic valves have been entrusted with this critical operation and that "Logan" engineers have had the privilege of collaborating with the Navy and L.S.T. builders in developing the hydraulic circuit which succeeded in opening these doors promptly, evenly and dependably.

"LOGAN" engineers are ready *now* to assist in solving your post-war problems involving the application of air or hydraulic power. Our 25 years' experience in designing and building air and hydraulic operated equipment is yours to command. Send us your specifications—or your problem.

LOGANSPORT MACHINE CO., INC., 902 Payson Road, Logansport, Indiana

"LOGAN" Air and Hydraulic Equipment

CHUCKS ★ CYLINDERS ★ VALVES ★ PRESSES ★ SURE FLOW COOLANT PUMPS

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

TOOL ACCESSORY LINE HELPS STANDARDIZE WORK (Q66)

Precision-built accessories designed to aid tool and die makers standardize and simplify their work have been introduced by Tool Craft Company. The firm offers press-fit piercing die bushings, press-fit stripper guide bushings and piercing die punches of high grade carbon steel in a range of practical sizes.

Substantial savings are claimed in time, materials and money through elimination of home-made die bushings and punches.

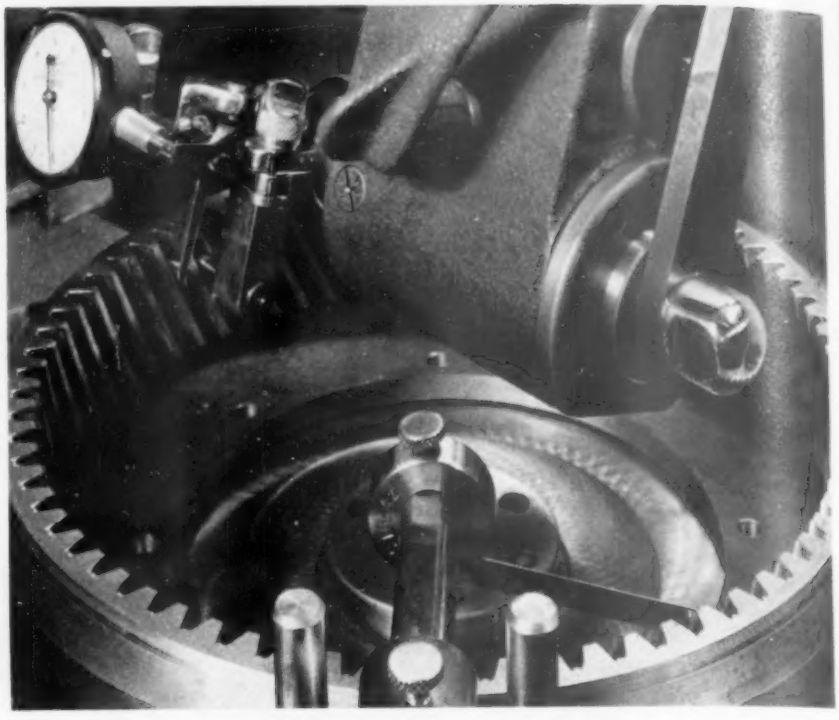
GEAR CHECKER SOLVES PROBLEMS OF ACCURACY (Q67)

Development of an internal gear checker resulted from the universal difficulty of accurately inspecting finished internal gears, according to National Broach and Machine Company, builders.

Function of this instrument is to check tooth spacing, eccentricity, pitch diameter and tooth diameter of spur or helical gears from three to 64 diametrial pitch and from two to 18" diameters. With an auxiliary head, parallelism of spur gear teeth may also be checked.

Principal elements of the machine are a rigid base, the top of which is finished, a work spindle mounted on precision anti-friction bearings, an adjustable counter-weighted column and the checking head carried on the end of an overarm, adjustable axially to and from the work spindle axis to accommodate gears of varying diameters.

(Concluded on page 176)



Machine checks accuracy of finished gears

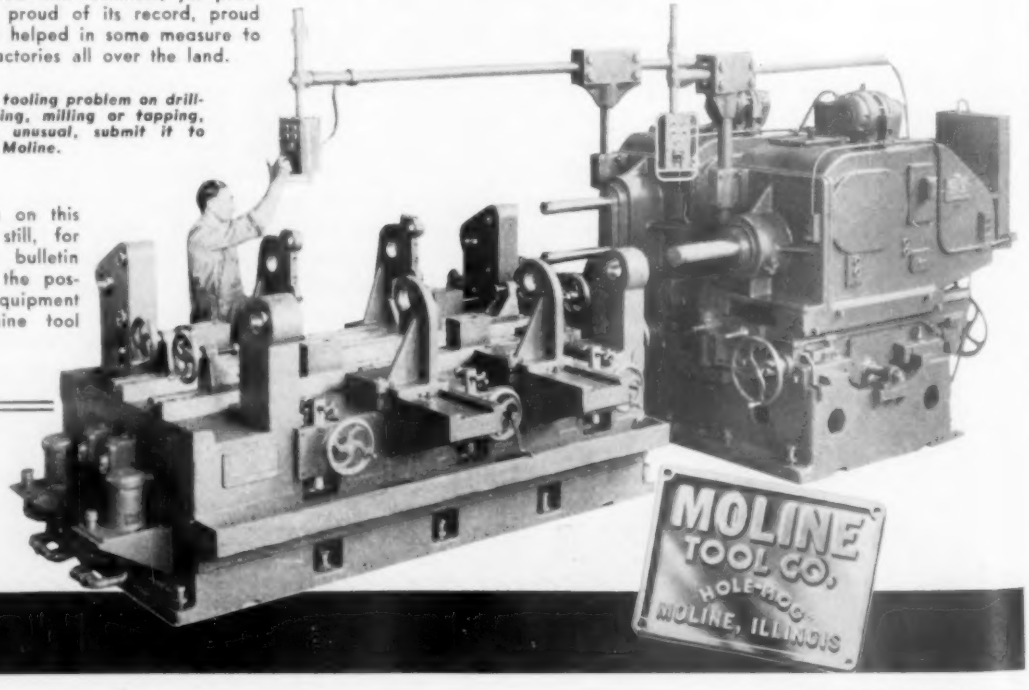
MOLINE *Licked a Special Boring Problem*

Since the beginning of the war, with the added need for specialized machine tools in new industrial uses, Moline has developed more machine tools for specific, unusual uses than ever before. Each one was designed to lick a particular, knotty, hard-to-solve problem; each one demanding engineering imagination coupled with technical, yet practical skill. Moline is proud of its record, proud that its facilities have helped in some measure to keep 'em rolling in factories all over the land.

● If you have a tooling problem on drilling, honing, boring, milling or tapping, no matter how unusual, submit it to Moline.

Send for information on this machine or, better still, for general descriptive bulletin which will show you the possibilities of Moline equipment for your own machine tool requisites.

The machine pictured here, the Moline MR121, is a Special Horizontal Boring Machine, designed for boring the crank and cam lines in three different diesel engine frames, the largest of which measures about 9 ft. by 4 ft. by 2 ft. over-all. Many unusual features were incorporated in the construction of the MR121, its features and operation make interesting reading.



Why WALES - STRIPPIT Has

Become the Headquarters for Hole Punching Equipment

Leading metal fabricators have found it profitable and time-saving to investigate Wales Hole Punching Equipment before putting holes in angles, channels, or sheets by any method.

The Wales-Strippit plant shown below is devoted *exclusively* to designing and manufacturing Wales Hole Punching Units and Notching Units.

In keeping with the progressive Wales-Strippit policy, "There's Always Something New in the Wales Line," new punching and notching equipment is continually being introduced to the metal working industry. Keep posted by writing for Catalogs TODAY.

WALES-STRIPPIT CORPORATION

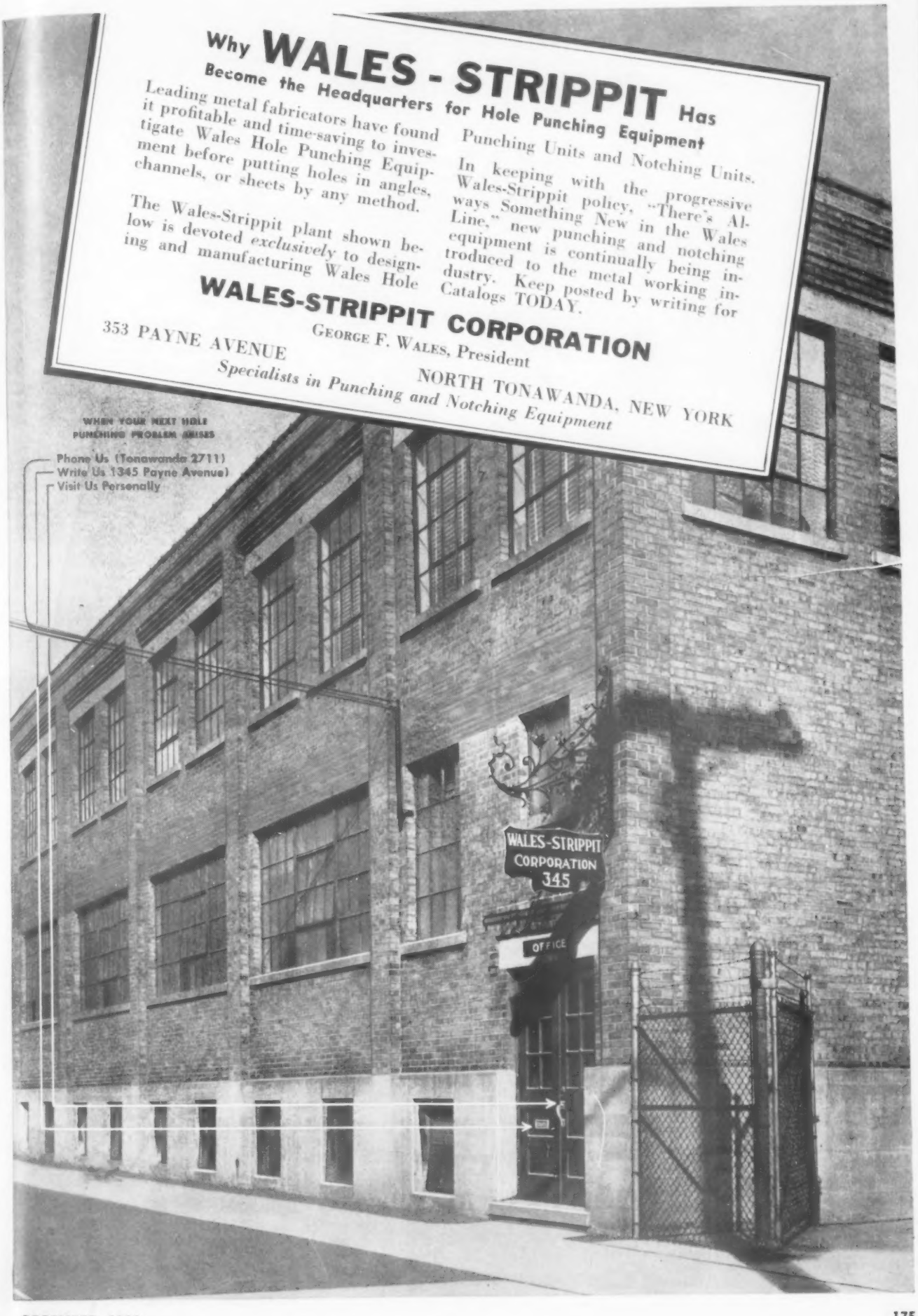
GEORGE F. WALES, President

353 PAYNE AVENUE — NORTH TONAWANDA, NEW YORK

Specialists in Punching and Notching Equipment

WHEN YOUR NEXT HOLE PUNCHING PROBLEM ARISES

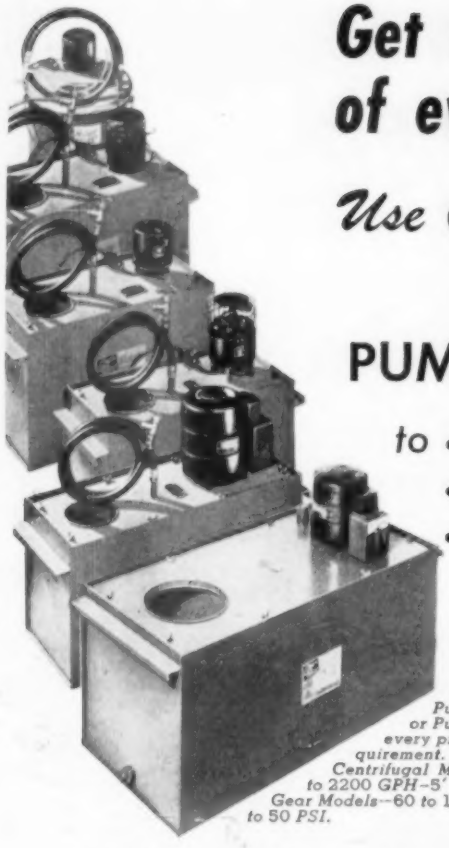
Phone Us (Tonawanda 2711)
Write Us 1345 Payne Avenue)
Visit Us Personally



Get the most out of every machine

Use GRAY-MILLS Portable PUMPING UNITS

to • INCREASE PRODUCTION
• PROLONG TOOL LIFE
• IMPROVE FINISH



There is a Gray-Mills Pumping Unit or Pump for most every production requirement. Centrifugal Models—3600 to 2200 GPH–5' head. Gear Models—60 to 180 GPH–10 to 50 PSI.

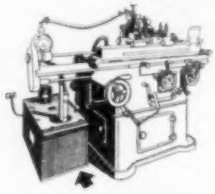
Gray-Mills complete, portable Pumping Units are suitable for many different jobs. They apply—in controlled volume, intermittently or constantly—coolants, lubricants, quenching and hydraulic oils, chemicals and other fluids.

Widely used as coolant systems on lathes, grinders, drill presses and other machine tools, they step up production, prolong tool life and improve finish. By their dependable performance, they quickly pay for themselves in lowest production costs.

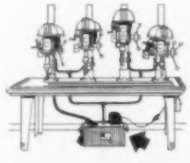
Gray-Mills Units are used also for automatic application of lubricants to punch press dies, and to provide a compact oil circulating system for machine lubrication.

Whatever your needs — you will probably find a Gray-Mills Unit or Pump the simple, low-cost answer.

Send for this new condensed catalog—gives complete details, prices and specifications.



COOLANT SYSTEM
Model 1000 Centrifugal Pumping Unit applying coolant in large volume to grinder.



COOLANT SYSTEM
Productive capacity of drill press increased by addition of this Gray-Mills Pumping Unit.

PUNCH PRESS DIE LUBRICATION
A Gray-Mills Pumping Unit supplying lubricant to a punch press die. Intermittent operation effected by Gray-Mills Flow Control System.

GRAY-MILLS CO., 1952 Ridge Ave., Evanston, Ill.

PROMPT DELIVERY

Complete Portable PUMPING UNITS

FRACTIONAL H. P. PUMPS
INDUSTRIAL FLUID REFRIGERATING SYSTEMS
PARTS CLEANING SYSTEMS

NEW EQUIPMENT

COMPANY INTRODUCES FEATHERWEIGHT GRINDER (Q68)

Madison-Kipp reports development of a new featherweight hand grinder actuated by compressed air. Standard speeds are figured at 50,000 R.P.M., although higher speeds are obtainable.

A typical model consists of 23 parts, with an overall length of 6½" and weight of 12 ounces. This extremely light weight is obtained through use of aluminum and magnesium, recently released by government agencies. The grinder accommodates accessories with ⅛" shanks.

New grinder built

TORQUE CONTROL AIDS PNEUMATIC IMPACT TOOLS (Q69)

Aro Equipment Corporation has added a ¼" impact wrench to their line. Operating with a controlled torque, the tool is designed to eliminate stretching or burning of threads in setting nuts, bolts and screws. THE END

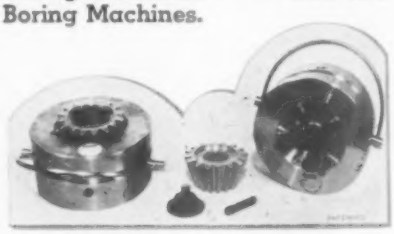
INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

GARRISON GEAR CHUCKS

are used on:

Gear Shapers . . . Drill Presses . . . Engine Lathes . . . Turret Lathes . . . Internal Grinders . . . External Grinders . . . Gear Tooth Grinders . . . Oscillating Grinders . . . Diamond Boring Machines . . . Horizontal Boring Machines.



and are used for:

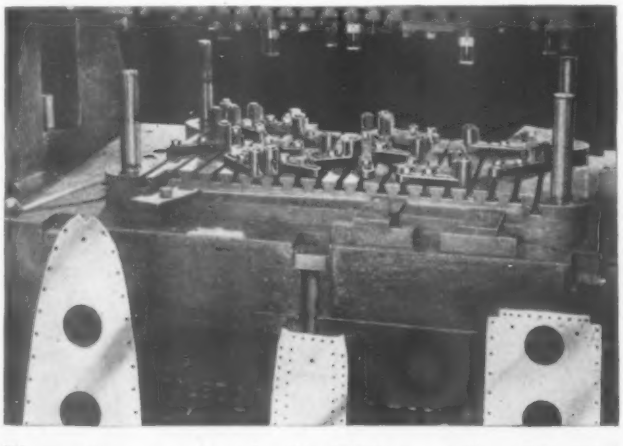
Grinding, Machining, Precision Boring and other operations on Spur, Internal, Bevel, Cluster, Helical and Herringbone Gears.

GARRISON MACHINE WORKS, Inc.
DAYTON 7, OHIO

YOU COULDN'T ASK FOR ANYTHING MORE SIMPLE — OR BETTER THAN

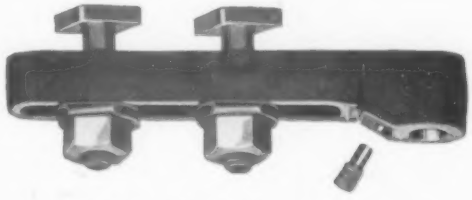
WHISTLER ADJUSTABLE PUNCH and DIE UNITS

Whistler Adjustable Dies work on any type press and because of their simplicity even new workers quickly learn to make pattern change-overs—increasing productive press hours. Absolute precision on short or long runs. Whistler design permits more perforations in a given area—often reducing press operations. For quick and complete information on the advantages of Whistler Adjustable perforating and notching dies send a description or drawing of your work.



These pieces produced with Whistler Adjustable Dies clearly illustrate the re-use of same punch and die units.

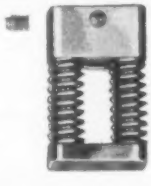
These photographs show the simplicity of a Whistler Adjustable Punch and Die assembly. Every piece is interchangeable.



Self-locking bolts on punch holder drop into T slots of die shoe. Set-screw engages into recess at base of punch. Punch cannot turn or pull out in operation.

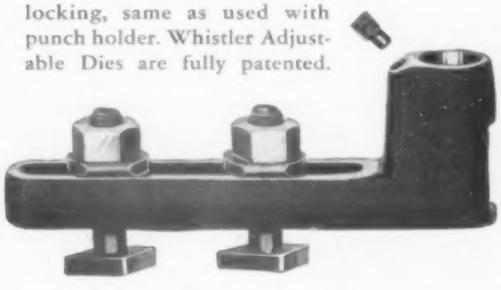
Punches of finest tool steel are machined to .0001" tolerances.

Stripper unit fits smoothly over punch—no "wobble". Flushed set-screw engages into groove on punch body. Stripper or punch quickly removed when desired.



Grooved heads on dies make lifting from holder quick and easy. Like the punches, dies are held firmly into holder by set-screw in recess at base. Whistler *precision* is known the world over.

Die holder has self-cleaning slug chute. Special design bolt heads present two bearing surfaces to T slot channel—self-locking, same as used with punch holder. Whistler Adjustable Dies are fully patented.



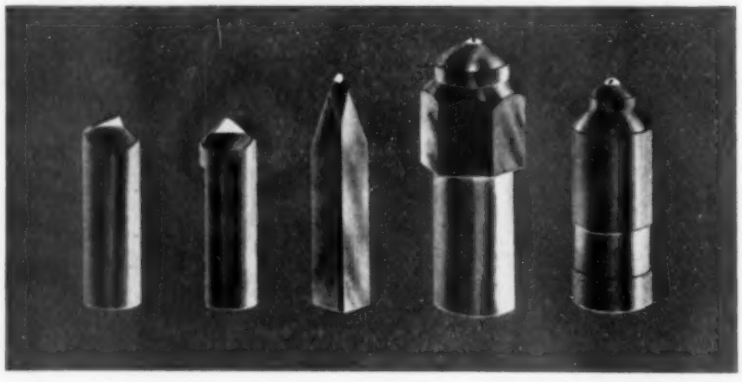
Write for the Whistler Catalog—every Production Executive should have it.

S. B. WHISTLER & SONS, Inc.

Over 25 Years of Tool and Die Making Experience

752-756 MILITARY ROAD BUFFALO, N. Y.

DIAMOND-POINTED **ADAMANT** PRECISION TOOLS



FOR EVERY INDUSTRIAL REQUIREMENT

● Wheel Dressing Tools — carefully selected, hard, sound diamonds — expertly mounted to withstand the rigors and hard knocks of today's increased production schedules.

● "DIATIPT" Shaped Diamond Cutting Tools for precision turning and boring. Unexcelled for machining bearing metals, copper, aluminum, hard rubber, Bakelite, celluloid and other abrasive materials.

● All diamonds set in our permanent mounting which will hold the diamond securely thru-out the complete life of the tool.

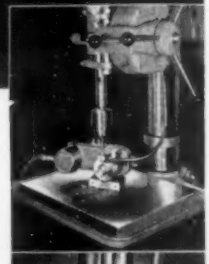
ADAMANT TOOL COMPANY

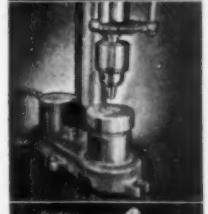
MAIN OFFICE
P. O. BOX 215,
BLOOMFIELD, N. J.

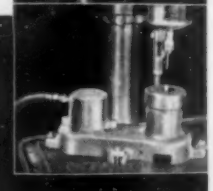
CHICAGO SALES OFFICE
110 N. PARKSIDE AVE.
CHICAGO, ILL.

Redmer AIR CHUCK

Accurately holds to depth at the same time it automatically centers parts for drilling, milling, tapping, etc. Needed in every plant where second operation work is done. Also for assembly or wherever a holding fixture to do precision operations is needed. Uses Brown and Sharpe type screw machine collets and simplifies "setting-up" operations and in most instances eliminates the making of jigs or fixtures. Has low consumption of air and its simplicity of construction eliminates expensive repairs.







Four models — No. 00 — No. 0 — No. 2 and No. 2 Special. Collet capacity from 1/16 to 1 3/16".

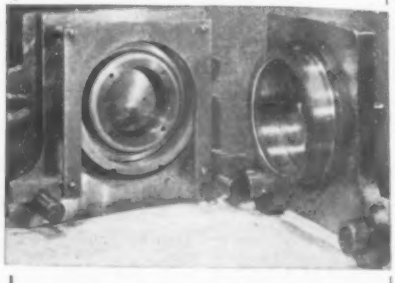
Literature on request
Write for Catalog Sheet

REDMER AIR DEVICES CORP.
611 W. WASHINGTON BLVD., CHICAGO 6, ILL.

Make Dies of Tool Steel TUBING

and *Save*

1 Time
2 Money
3 Manpower
4 Metal



THIS DIE IS MADE OF 4 TOOL STEEL TUBES

The blanking and drawing die shown above was made of **BISCO** tool steel tubing at a fraction of the cost of forging rings or boring solid bars. When you bore tool steel bars to make dies or machine parts, you are simply manufacturing turnings. You are wasting steel, money, time and labor, all of which can be saved by the proper use of **BISCO** tool steel tubing. Why not let us give you more information on this subject?

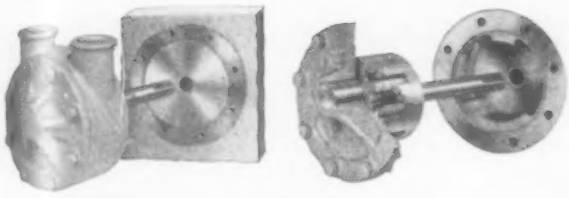
Send Today For This Folder →

IMMEDIATE SHIPMENT FROM STOCK:

N.E. Steels and Standard S.A.E. Steels, both Carbon and Alloy, Hot Rolled and Cold Drawn • Chisel Steels • Cumberland Ground Shafts • Drill Rod • High Speed Steels • Shim Steels • Tool Steels.

BISCO

THE BISSETT STEEL CO.
945 EAST 67th ST., CLEVELAND 8, OHIO



STRIPPED . . . for Action and Economy

how TUTHILL PUMPS can be built into the design of your machine

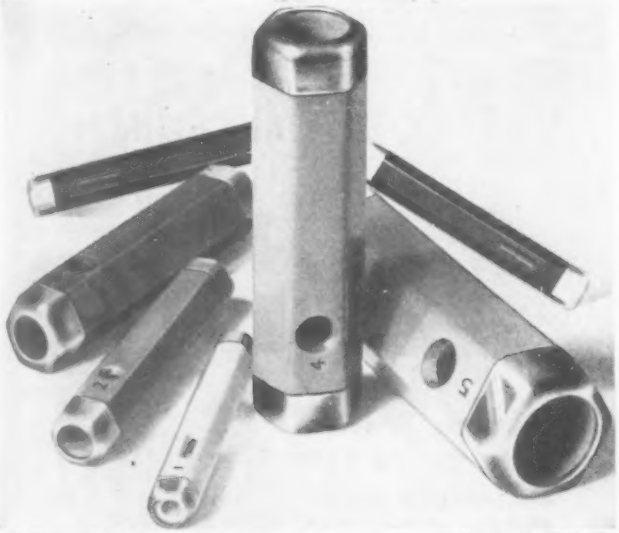
To save space, material and money, Tuthill builds stripped pumps for you to incorporate directly into the design of your machine. These internal-gear rotary pumps are furnished without mounting bracket or without housing as pumping elements —for coolant, lubrication, hydraulic and liquid transfer service. Capacities from 1 to 50 g.p.m. Write for Tuthill Stripped Pump Bulletin.

★

Tuthill Pumps are serving Army • Navy Air Force • Merchant Marine and Industry

TUTHILL PUMP COMPANY

939 East 95th Street • Chicago 19, Illinois



FEDERAL *Taperlock* PLASTIC GAGE HANDLES

Made in durable plastic to accepted standard dimension, they are tough and long-lasting. ◧ Light in weight—one-third lighter than aluminum—a feature that permits the sensitive "touch" so necessary in close tolerance gaging. ◧ Ideal for glass gages because their light weight reduces the danger of chipping and breaking when dropped. ◧ They are easily marked for identification with the same stamps and tools used for marking handles of other materials. ◧ Federal Plastic Gage Handles possess insulating properties that protect gages from bodily heat that might affect accuracy. ◧ SEVEN SIZES—00-0-1-2-3-4-5. ◧ FOUR COLORS—Red, Yellow, Green, Black.

PROMPT SHIPMENT on Rated Orders.

FEDERAL TOOL CORPORATION

402 North Leavitt Street Chicago 12, Illinois

Ingenious New Technical Methods

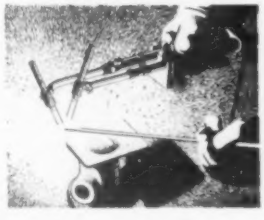
Presented in the hope that they will prove interesting and useful to you.

New 9000° Arc Torch can be used for Welding and Brazing all Ferrous and Non-Ferrous Metals and Alloys

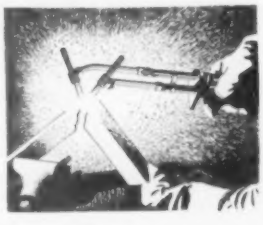
Now an arc torch that makes it possible to do most jobs *electrically* that previously were thought possible only with gas. This attachment for arc welders provides an independent source of heat by means of two carbons. It is capable of producing intense heat, approximately 9000° F., over 2000° hotter than an oxyacetylene flame. Pure heat, no oxygen or gas to contaminate the weld. No pressure to force the molten metal away or blow holes in light sections.

Developed to capitalize to the fullest on the time-saving advantages of electric welding, the new Mid-States 9000° arc torch can be used with any AC or DC electric welder. It opens up new horizons of service in this field, never before possible with an electrically operated instrument.

New uses are being found every day for products that have been familiar to us for years. Wrigley's Spearmint Gum, always enjoyed for its chewing satisfaction, is now proving with the fighting men overseas many benefits which will be useful to you in peacetime. One of the big factors in mass production is the alertness and efficiency of the man on the job. The chewing of Wrigley's Spearmint will help keep you alert and wide-awake during those work periods that, while seemingly dull and monotonous, call for watchfulness in order to get perfection in the final assembly.



For BRAZING Steel, Cast Iron, Malleable Iron, Copper, Brass, Bronze, and other ferrous and non-ferrous metals.



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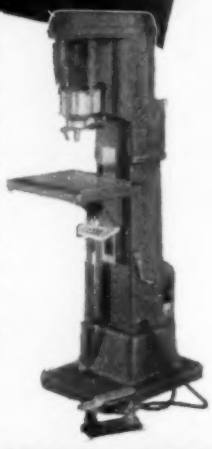
AIR CONTROL is the Secret of precision tapping The Haskins Way

Accuracy—to a class 4 fit when necessary—is constant—each part is tapped exactly like every other, independent of operator efficiency. AIR regulates the complete tapping cycle—not only the down stroke, but its control is so sensitive that the tap is allowed, in effect, to float out of the part. Tap life is longer—tap breakage practically eliminated. Send today for your copy of catalog on Tapping—The Haskins Way. R. G. Haskins Co., 2756 W. Flournoy St., Chicago, Illinois.



HASKINS *haskins*

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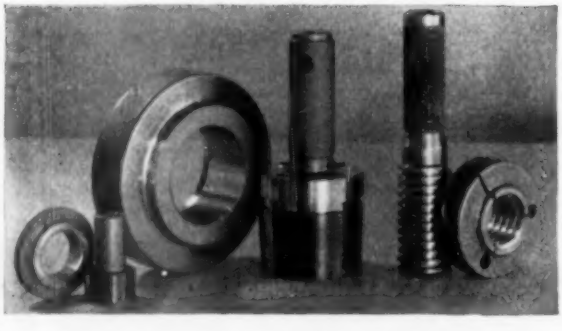
Meter Precision With Exact Gages



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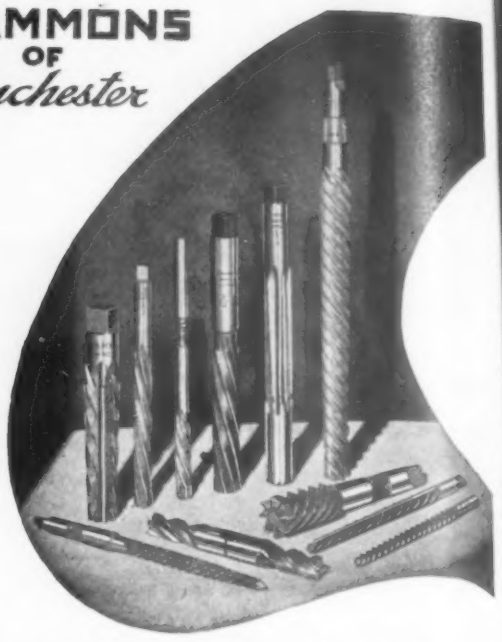

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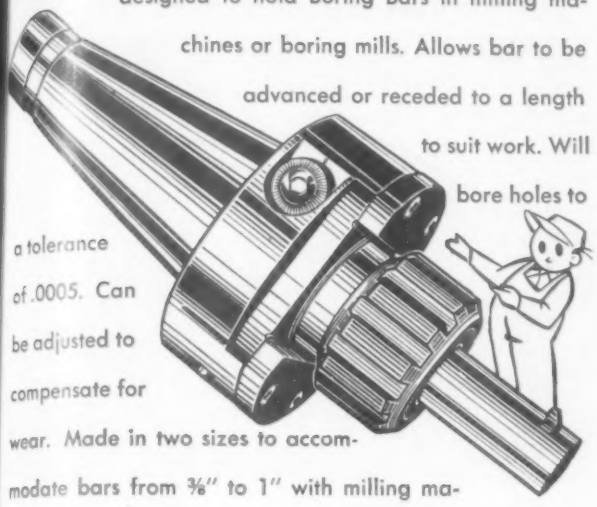
Especially designed to hold Boring Bars in milling machines or boring mills. Allows bar to be advanced or receded to a length to suit work. Will bore holes to a tolerance of .0005. Can be adjusted to compensate for wear. Made in two sizes to accommodate bars from ⅜" to 1" with milling machine taper or Morse taper shanks. Write for catalog.



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For Carbide Tools

Resinoid bond diamond wheels for the grinding of carbide-tipped tools in large quantities or on a production basis. Their sharp, free-cutting action provides rapid stock removal, without appreciable wear. Also for fixed feed, precision grinding operations, such as cylindrical, surfacing, internal and cutter grinding.

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C/R Hammers have permanent malleable iron heads which take replaceable insert faces of coiled mechanical rawhide.

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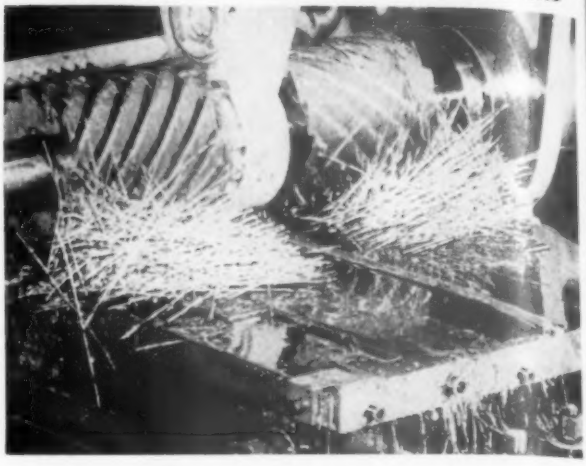

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FIVE SIZES—18" to 36"

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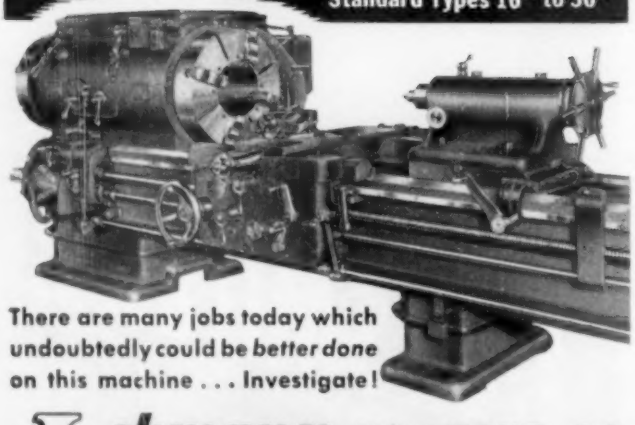

There are many jobs today which undoubtedly could be *better done* on this machine . . . Investigate!

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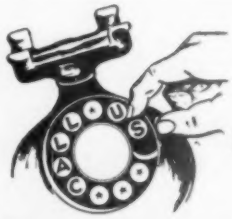

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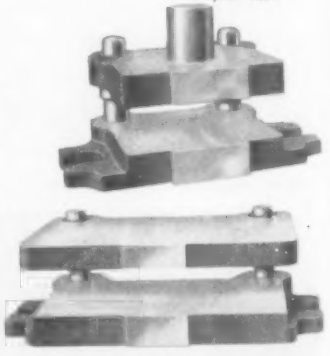

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No Chatter

with the **Red-E Shaper-Planer Tool** because the cutter is back of the line of deflection and any spring of the tool takes it away from the cut and not into it, as when a lathe tool is used in a shaper.

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BRIDGEPORT, CONN.

Simplified Grinding

with PARKER-MAJESTIC

Internal and External Grinders

For precision grinding . . . internal or external . . . Majestic simplicity of design and flexibility of changeover guarantee maximum grinding output at low cost.

Send for descriptive circular . . . NOW!

Representatives in all principal cities.

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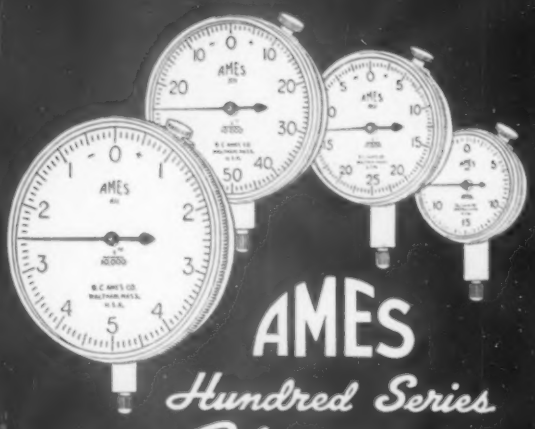

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DIAL INDICATORS

4 SIZES

14 DIAL FACES

Ames Dial Indicators have small and accurately made gear trains for indicating size variations as fine as .0001". These highly sensitive gear trains are protected from damaging shocks by a simple shock-absorber which does not change their action or appearance.

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B. C. AMES CO.

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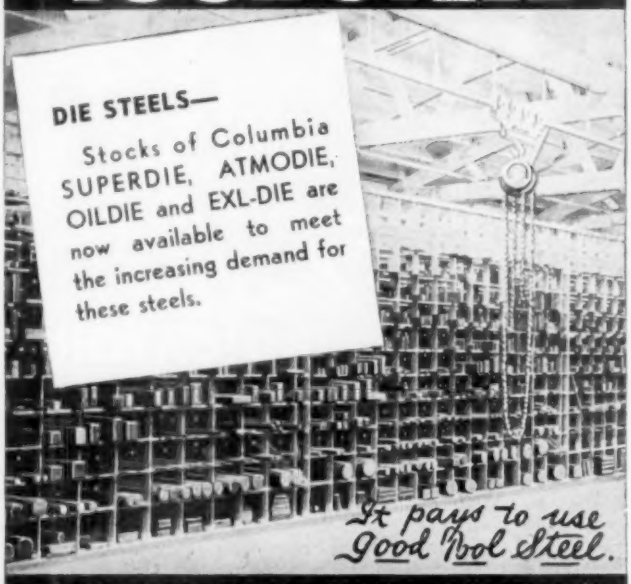
Columbia TOOL STEEL


DIE STEELS—
Stocks of Columbia SUPERDIE, ATMODIE, OILDIE and EXL-DIE are now available to meet the increasing demand for these steels.
It pays to use Good Tool Steel.

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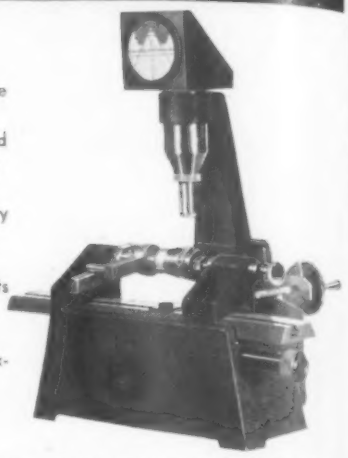
New THREAD PICK-UP PROJECTOR INCREASES GRINDER PRODUCTIVITY AS MUCH AS 50% . . . SOMETIMES MORE!

- Reduces grinding time
- Wheel and Diamond Life greatly prolonged
- Stock removed equally from both flanks
- Salvages threaded parts oversize .0003 or more
- Beginners can use expertly—quickly



The Thread Pick-up Projector is an optical device for setting the driving dog on pre-threaded work. Allows grinding wheel to enter trough of thread to remove finishing stock from both flanks accurately and without adjustment. Lead is picked up while previous piece is being ground — ***no time is lost.*** Viewing screen enlarges thread for quick, accurate check of root depth and angle. Picks up A.N., Acme and Whitworth threads. Operates in conjunction with any thread grinder.

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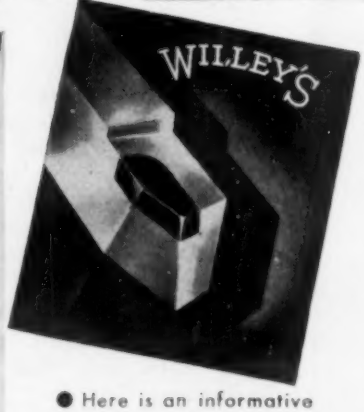

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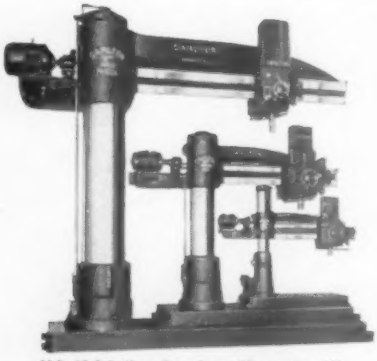

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1—LOW HUNG DRIVE TO THE SPINDLE
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MACHINE TOOL COMPANY
CINCINNATI, OHIO, U.S.A.

THIS MACHINE TAPS 1¼" HOLE IN STEEL EVERY 20 SECONDS

• Shown in the plant of the Edward W. Daniel Company of Cleveland, this high-speed automatic Cleveland Tapping Machine is tapping 1¼" diameter, 2½" deep holes in forged steel turnbuckles 300 percent faster than they have ever been tapped before—and is making taps last longer in the bargain!

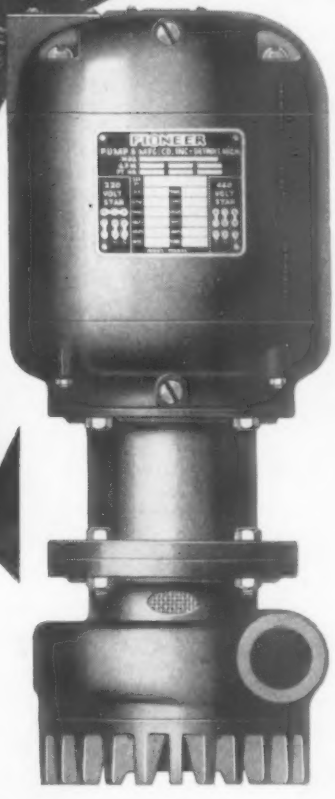
• Back of this record is the principle of the lead screw, which controls the speed of the tap and the pitch of the thread being cut with absolute precision. Lead screw control (1) steps up tapping speeds, (2) improves thread accuracy, and (3) reduces tap wear and breakage. Cleveland Tapping and Threading Machines will tap class 3 threads on a production basis, and have *tapped as many as 10,000 holes with a single tap.*

You'll find a lot of useful data in "Guide for Production Tapping." Send today for FREE copy.

Users of this machine enjoy many additional advantages. Why not write and learn what they are?

CLEVELAND
LEAD SCREW
TAPPING MACHINES
★
THE CLEVELAND TAPPING MACHINE CO.
1725 SUPERIOR AVE. CLEVELAND 14, OHIO

Serving on most of the Famous Production Lines!



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• MACHINE TOOL ENGINEERS developed and built Pioneer Pumps to provide better coolant flow for the machines they were designing.

• 400 STANDARD Pioneer MODELS cover a remarkable range of application.

• LONGEST-LIVED PUMPS ever built, production men say, because not a single quality feature has been sacrificed.

PIONEER MODEL "VS"

DESIGNED FOR SHALLOW TANKS OR CHIP PANS!

Designed to be set on the bottom of the pan or tank, possibly without clamping or holding brackets. Will operate efficiently with extremely low coolant level. A compact unit.

PIONEER Pumps
HIGH EFFICIENCY • LOW POWER CONSUMPTION
GREATER VOLUME AND LESS MAINTENANCE

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T. M. REG. BY THE BRAMSON PUBLISHING COMPANY

OF INTEREST TO PRODUCTION EXECUTIVES

(1177) Welding Equipment

Accumulation of eight years of intensive research and development contributes to text of a new welding manual and catalog edited and published by Welding Equipment and Supply Company. The 40-page booklet includes technical data on metallic arc tool steel welding. The booklet outlines time and material saving processes of value in planning postwar conversion. The book is fully illustrated to augment technical text.

(1178) Technical Bulletin

Amounting to a technical treatise on medium high carbon open hearth steel and low carbon open hearth carburizing steel, a booklet by Monarch Steel Company completely describes Speed Case and Speed Treat, two steels produced by Monarch. Fully illustrated.

(1179) Metal Quality

Members of the Drop Forging Industry have collaborated in preparation of an interesting issue of trade literature entitled, "Metal Quality". The industry intends their 40-page booklet for users of forgings, engineers, production and management executives and instructors in engineering and metallurgy. Illustrated with more than 200 halftones and diagrams, the book is a valuable guide to drop forging.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(1180) Toggle Action

Knu-Vise, Inc., is circulating a 58-page catalog showing their toggle action clamping devices, fully illustrated with photographs and drawings. Also included are engineering data, showing recommended loads, weights and sizes of the firm's various products. The catalog covers clamps, "C" clamps, pliers and wrenches.

(1181) Lathe Literature

A new catalog covering products of the South Bend Lathe Works is available. The 66-page catalog covers toolroom lathes, quick change gear lathes, plain change gear lathes, turret lathes and attachments, features and specifications. Twenty-one lathes are handsomely illustrated in full page color photographs.

(1182) Dust Collectors

Individual type self-contained dust collectors for use on grinders and sanders are described in a new catalog being distributed by Aget-Detroit Company. Features of the publication are indexing according to grinder size for rapid selection of proper dust collector and ease of determining cost of unit and accessories without "reference" back and forth through catalog.

(1183) Contract Services

Tooling problems for new or improved products may be solved for customers through a contract service described in a new bulletin issued by Sheffield Corporation. The booklet graphically presents Sheffield services available, including design and manufacture of tools, jigs, fixtures and gaging equipment.

(1184) Drill Pointing

Facts useful in correcting difficulties with twist drills are contained in a publication of Chicago-Latrobe Twist Drill Works entitled "Correct Drill Pointing". Photos and drawings are reproduced to illustrate correct grinding procedures. A table of cutting speeds is included.

(Continued on page 188)

Made To Fit Any Machine

Furnished with male or female taper, straight, threaded or special shanks to fit any machine used for tapping or reaming.

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Make TAPS AND REAMERS LAST LONGER!

Here's How!

Before discarding taps and reamers as worn out, try them in a Ziegler Floating Holder and you will find that many of them are still good for a long period of service.

Taps and reamers are often blamed for causing oversize or bell-mouthed holes when the only thing wrong is misalignment of the spindle with the work. By automatically correcting alignment inaccuracies up to 1/32" in radius, the Ziegler Floating Holder enables the tool to perform perfect work even though the set-up may be faulty.

Don't make the mistake of scrapping taps and reamers too hastily. Before calling them worn-out, try them in a Ziegler Holder. It will save you tool expense.

W. M. Ziegler Tool Co.
1920 Twelfth St.
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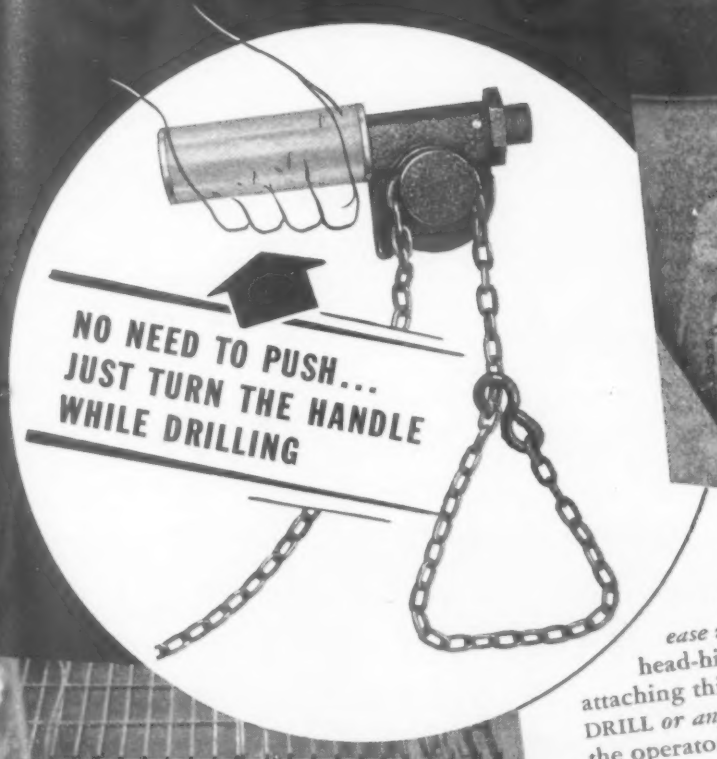
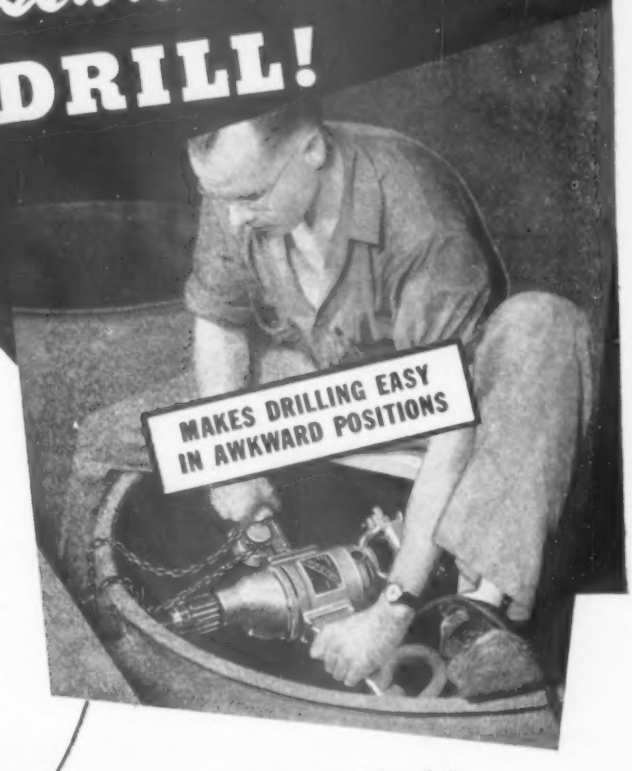
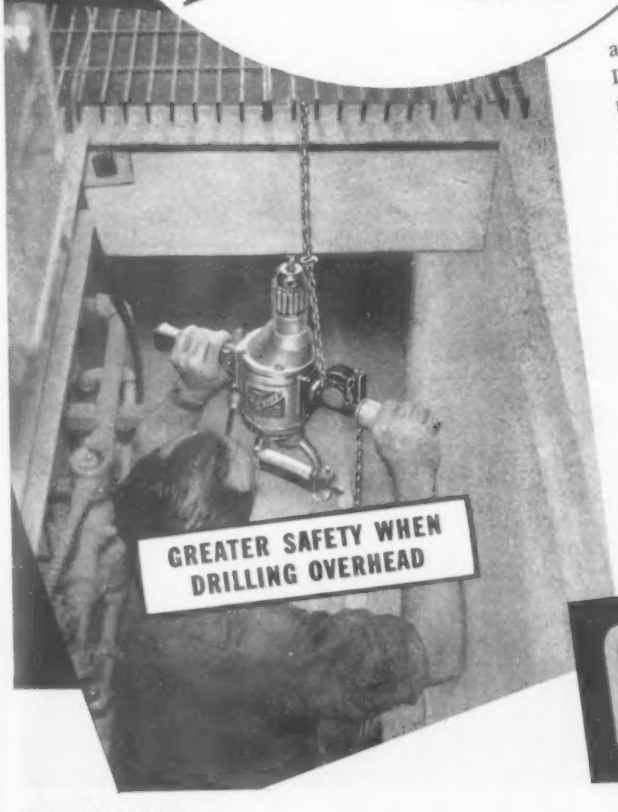
Ziegler ROLLER DRIVE FLOATING HOLDER for Taps and Reamers...

MAKE ANY DRILLING JOB in any position EASIER with this *Pressure Handle* on a SKILSAW DRILL!







● Now you can drill with *extra ease* and *extra safety* in any position . . . head-high, overhead or on ladders . . . by simply attaching this Pressure Handle to your SKILSAW DRILL *or any make of drill*. Pressure Handle gives the operator complete control of drilling pressure at all times . . . eliminates twist drill breakage . . . saves the time of an extra man with ropes or chains to hold the drill.

Fits SKILSAW DRILL Models "64", "80", "82", "83", "101", "103", "121", "123", "141", "143", and all other makes of electric or pneumatic drills of from ⅜ in. to 1 in. capacity in steel.

Sold Nationally Through Skilsaw Distributors for $30.

Ask your distributor today for a demonstration of this Pressure Handle on your own work.

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SKILSAW PORTABLE ELECTRIC TOOLS
MAKE AMERICA'S HANDS MORE PRODUCTIVE

(1185) Milling Difficulties

Improperly ground cutters contribute most of the difficulties encountered in the use of milling machines and cutters, according to evidence collected by Ingersoll Milling Machine Company. The firm has prepared a wall chart to illustrate basic grinds for use on different materials. The chart is suitable for mounting on tool room walls.

(1186) Machining Fluids

Extremely informative is the new publication of D. A. Stuart Oil Company entitled "Cutting Fluids for Better Machining". The booklet contains a discussion of the metal cutting mechanism, showing theories on metals cutting. It discusses selection of proper tools, cutting fluids and operational procedure. Besides a description of various cutting fluids, numerous charts and valuable tabular data are contained. Attractively illustrated.

(1187) Institutional Book

Graphically portraying its contribution to the war effort, Moore Drop Forging Company has published a booklet entitled "The Men and Women of Moore". The contribution is depicted through color photography in a handsomely bound brochure.

(1188) Better America

Visioning a better America through alert industry, Clearing Machine Corporation has published its views on tomorrow in a booklet entitled "Building a Better America". President R. W. Glasner in the foreword urges accomplishment of facts rather than plans. The booklet gives hints on how.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(1189) Eccentric Drives

Moreland Tool Company has published a 20-page catalog which illustrates a new counter bore drive that is shearproof. The tool uses the eccentric principle to equalize the torque load on the holder and the mating drive member of the cutter. Following a full description of the new tool, there is a list of special high speed cutting tools.

(1190) Tantalum-Tungsten

Vascoloy-Ramet Corporation makes full use of photos and engineering drawings to illustrate their line of Tantalum-Tungsten Carbide tools and blanks. The catalog is now available for distribution. Full specifications are supplied through accompanying tables. An unusual feature is the complete index carried on the front cover for convenience in locating items listed.

(1191) Roto Finishing

Describing a new method of deburring and finishing metal parts and castings, a folder has been published by Sturgis Products Company. The booklet details the Roto-Finish process to eliminate hand methods for deburring.

(1192) Reference Manual

An interesting publication is being currently circulated by Murchey Machine & Tool Company. Designed primarily for use by sales and service organizations handling Murchey Threading Equipment, the editors have included material generally useful to the machine tool industry. It is loose leaf for later inclusion of new or corrected material.

(1193) Shankless Drilling

Full description of Republic Drill & Tool Company's new SHANKLESS drill is contained in their recently printed technical data manual. Besides enumerating specifications of drills and drivers, the publication devotes a section to advantages claimed for this new development in twist drills. A more fully illustrated catalog is also listed.

(1194) Metals Cutting

Two publications of Pipe Machinery Company detail the firm's cutting tools and thread milling cutters. Attractively laid out in color, the folders show typical samples of the company's tools.

(1195) Steel Publication

Striking illustration of the contribution of steel to war and to peace is con-

(Continued on page 190)

Now . . . A TOTAL OF 1023 ITEMS IN THE PUTNAM LINE . . . IN STOCK, READY TO BE SHIPPED IMMEDIATELY

Tools THAT CUT FASTER . . . LAST LONGER

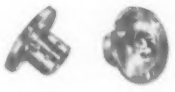
NEW PUTNAM STANDARD TOOLS
1 Spline Mill
2 Heavy Duty Shell End Mill
3 T-Slot Cutter
4 Corner Rounding End Mill

The addition of new sizes and types of present End Mills, Reamers and Counterbores to provide greater and more complete range, and many new items (a few illustrated above), make today's Putnam standard cutting tool line the greatest in our history. Our new 92-page catalog illustrates and lists every item. Your copy will be sent without obligation if request is made on your company letterhead.

ARMY E NAVY

PUTNAM TOOL COMPANY
2987 Charlevoix Avenue • Detroit 7, Michigan

GREATER ACCURACY—MORE PRODUCTION ON PARTS LIKE THESE with the SUNNEN PRECISION HONING MACHINE

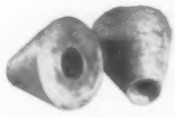


Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

Roller Bearing Outer Race. Finish improved from 12 micro inches to 2 micro inches.

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

Saved time in producing a smooth accurate finish on this bronze remote control valve body.

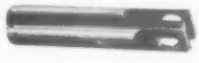


Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."

Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

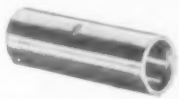
Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."



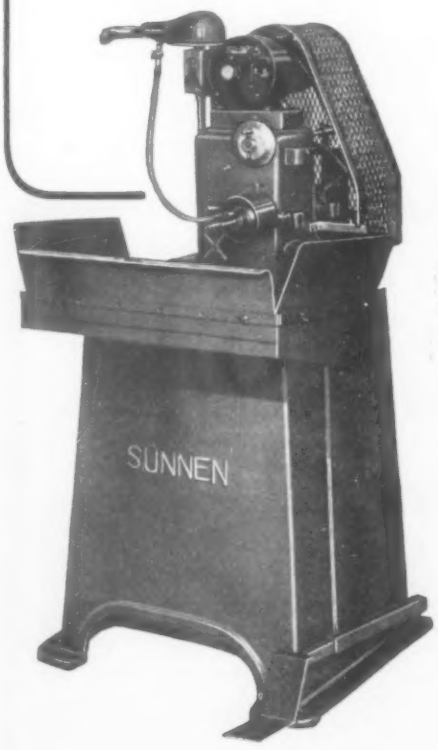
Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro inch finish.

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping — and gave a straighter hole.



Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.



Now you can get even greater accuracy and more production per hour than ever before with the improved Sunnen Precision Honing Machine. This machine is now furnished with a larger base containing a coolant pump, which provides a constant flow of honing fluid to the part being honed. The fluid acts both as a coolant and a lubricant, giving better honing properties to the abrasive. You get a smoother finish, more accurate work in less time.

Consider These Advantages, Too

- **Hones and finishes internal cylindrical surfaces from .185" to 2.625"**
- **Can be used in any metal or plastic except lead or babbitt**
- **Does not require skilled labor**
- **Accuracy guaranteed within .0001"**
- **No jigs or fixtures needed**
- **Economical to operate**
- **Quickly and easily set up**

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

Why not write today — asking a Sunnen engineer to show you how it can be used on your jobs — or ask for a bulletin giving complete information?

SUNNEN

SUNNEN PRODUCTS COMPANY, 7932 Manchester Ave., St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

tained in a brochure published by Bliss & Laughlin, Inc. Entitled Cold Finished Steel, the booklet treats the process, its growth, its uses and applications in many industries. Typical applications are illustrated, from a special spark plug on General Doolittle's Tokyo Express to a pinion on a corn picker.

(1196) Dominant Driving

Thumbnailing man's struggle to transmit power, the Research Committee, Multiple V-Belt Drive Association, has edited "From the Shadoof to the Dominant Drive". While advancing the cause of V-Belts, the booklet carries from use of a lever to present power transmission means. Profusely illustrated.

(1197) Dial Indicators

Accuracy of jeweled dial indicator gages is advanced in the recent catalog published by B. C. Ames Company. In 40 years of gage making, Ames has collected "know how" that is incorporated in its new lines featured in the publication. Besides a full line of manual gages, the firm offers various applications with suitable mounts. Fully illustrated and described with engineering drawings and specifications.

(1198) Hole Punching

Introducing the newest technique of hole punching, Wales-Strippet Corporation has printed a new catalog. The technique has been designated Type "CD". It is fully described in the booklet with text, photography and drawings. Completely described is the simple design and precision finishing of each punch.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(1199) Reference Book

A machine shop and industrial reference manual is available from Charles H. Besly and Company. The book contains information on tap selection and provides complete tables covering tap fits, basic thread dimensions and tap drill sizes. Also included are recommended speeds, lubricants and angle of cutting face for various metals. Other information is included. The book is printed on heavy, varnished stock with a binding to permit book to remain open at a desired page.

(1200) Friction Cutting

Describing and illustrating the new DoAll Zephyr high speed friction cutting machine, a bulletin is being distributed by Continental Machines, Inc. The folder gives specifications and high operating speeds of the machines, in fabricating of many materials.

(1201) Cutting Tools

Putnam Tool Company is currently circulating a 92-page catalog highlighting their complete line of cutting tools, comprising 1023 items. Each item is illustrated in two colors with suitable engineering data and prices added. A section deals with special tools. Ruggedly bound. Printed on heavy paper.

(1202) Ingenious Promotion

Loose leaf photographs, 8 x 10", illustrate installations of Bellows Company. On the reverse side is printed engineering details of the installation. In a file folder, the promotion includes 25 photos, a price list and a folder in colors. Each photo is said to represent an installation leading to better, safer or increased production.

(1203) Gage Catalog

Featuring three exclusive gage developments, N. A. Woodworth Company is offering a new catalog of its products. Also newsworthy is announcement that specifications under H-28, standards in addition to the H-25 standards, have been included. Woodworth claims this is the first inclusion of the new standards in current catalogs. Woodworth further believes these newer standards will be accorded general adoption after the war, according to the publication.

(1204) Lubrication Book

Angled at effective reduction of shop maintenance costs through correct lubrication, Cincinnati Milling and Grinding Machine Company has published a

(Concluded on page 192)

THE IMPROVED NIELSEN LIVE CENTERS

★

Load capacity 200 to 40,000 lbs. at 100 rpm

Have adjustment to take up wear and preload bearings

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Standard Morse Taper No. 2 to 6 in stock

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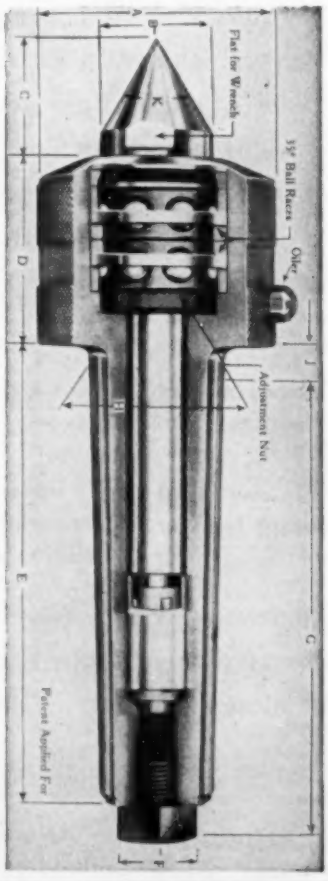

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★4 Tool Changes
★Sizes for All Lathes
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TO SECURE ±.0005" ACCURACY *with the* Wickman PROFILE GRINDER

TYPICAL EXAMPLES OF WORK GROUND AND INSPECTED ON THIS MACHINE WITHOUT USE OF RADIUS DRESSER OR FORMED WHEEL

The Wickman Profile Grinder is a machine which makes possible substantial savings in machining time. It produces extremely accurate work, tolerances even closer than ± .0005" being secured with reasonable care in operation.

Of most importance, these production advantages can be effected in your plant with relatively unskilled operators assigned to the machines. Any person of average intelligence can be trained in a very short time to become thoroughly efficient in the Wickman method of profile grinding.

The layout and brain-work are done in the drafting room. The operator has nothing to measure. She sees it done. She knows at all times where every point on the contour is, during its development, in relation to every other point on the tool without removing it from the machine for partial inspection. Write for completely descriptive literature.

Cemented-Carbide Tipped Form Tool
Width of Carbide Tip . . . . . 1¾"
Stock Removed . . . . . approx. .040"
Grinding time including set-up and complete inspection of contour before removal from machine . . . . . 3½ hrs.

Circular Form Tool with Preformed Cemented-Carbide Tips
Stock Removed . . . . . .015"
Grinding time including set-up and complete inspection before removal from machine
approx. 2 hrs.

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Trimming formed parts . . . Cutting Sheet Steel, 1-inch Armor Plate, Plastics or what have you . . .

"The process is to some so spectacular that they refuse to believe their own eyes" — so writes the chief tool research engineer for one of the largest aircraft corporations. Previous cutting costs are radically reduced, difficult and slow cutting of certain materials made swift, easy and safe. By all means write for your copy of "FRICTION SAWING" by Arthur A. Schwartz, Chief Tool Research Engineer, Bell Aircraft Corporation which will soon be off the press. It's free.

Write for Your Copy

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN

—NEW LITERATURE—

new booklet, entitled "Lubrication". The edition provides complete information for lubrication of Cincinnati Machines. Illustrated with engineering drawings. Sturdy binding.

(1205) Finishing Compounds

Sixty pages of information on finishing compounds are contained in a new publication of Carborundum Company. The pocket-sized edition covers a variety of data compiled in Carborundum research.

(1206) Resistance Welding

A comprehensive and informative new bulletin on resistance welding is being offered by Progressive Welder Company. Designed primarily as a guide to the wide variety of uses to which resistance welding adapts itself the book also touches on increase in scope of the welding process.

NEW BOOKS

Aircraft Sheet Metal Work by C. A. LeMaster. American Technical Society. 388 pages. Price $3.75.

A comprehensive survey of sheet metal working angled at the aircraft industry. Arranged on a simple to more complex system, the text embodies information of use in training apprentices and has full value as a refresher course for more or less experienced mechanics. Beginning with material of a general nature, the author follows a definite plan to lead through tools, blue print reading, mensuration, template layout into actual operations, beginning with easy operations and leading to more complex. Emphasis throughout is on the "how to do it" aspect. Illustrations, 177 in all, and 56 tables augment the text. Completely indexed for ready reference. Easy to more difficult projects, involving few tools and little material, follow chapters. A useful addition to technical literature.

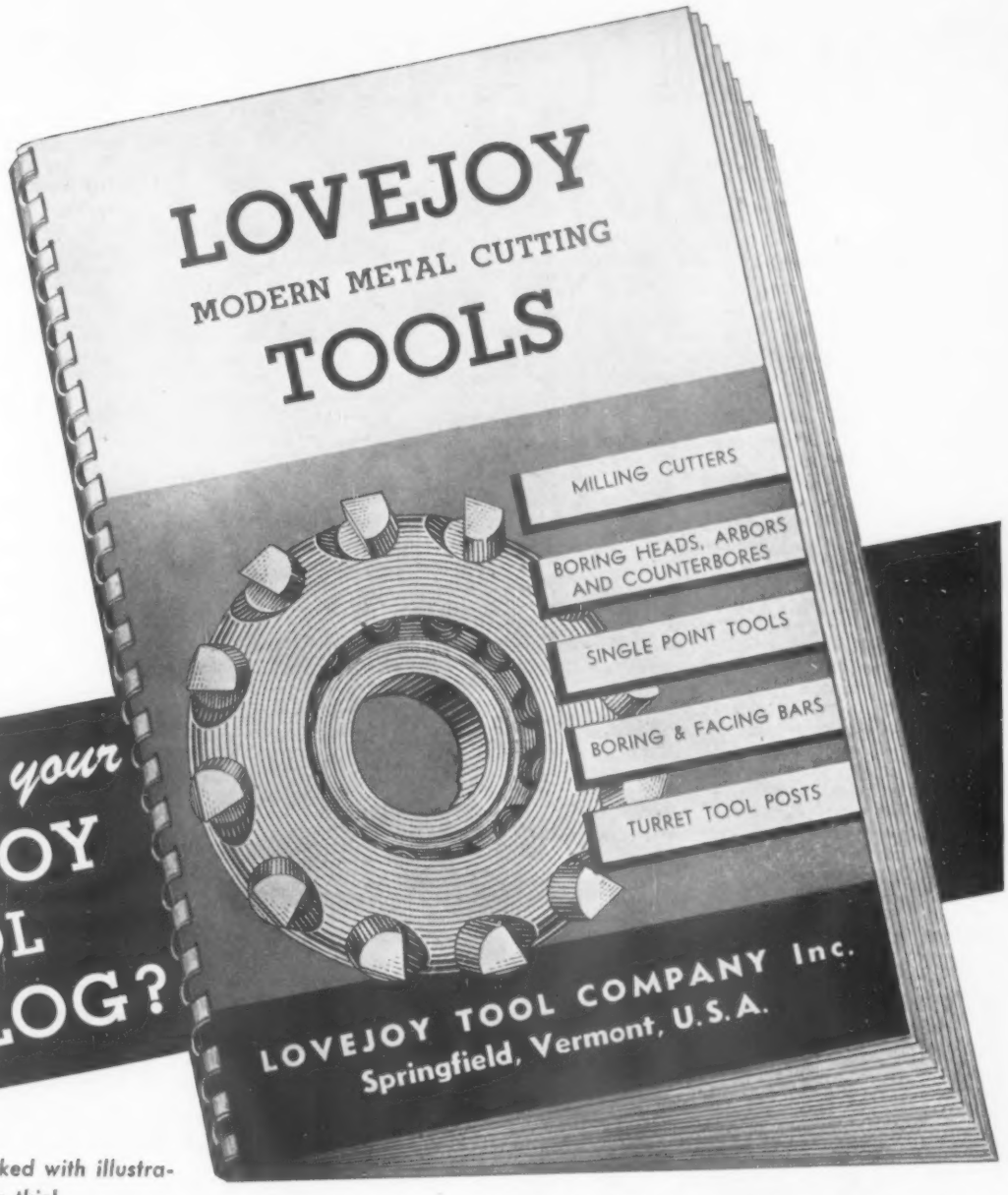
* * *

The Industrial Supervisor by John M. Amiss and Traver C. Sutton. The Ronald Press Company. 243 pages. Price $3.00.

A summation of current literature on foremanship, liberally sprinkled with the lore of classical education. Beginning with responsibilities of supervision the authors lead through qualifications, training, leadership, and so on to climax with a chapter on "Ethics". Interesting proposition is that supervision is a profession. There is nothing creative in the text, excepting a "self analysis" chart. Strongest point is simplicity of language. Could be strengthened by biliography of sources and parallel readings. The authors suggest it for self study. An interesting enough writing on the subject of supervision to add to trade literature. THE END

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.



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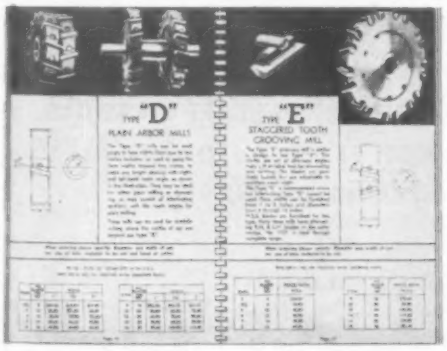
There are 38 pages packed with illustrations and information like this!



If you have not already sent for the NEW Lovejoy Tool Catalog, mail the coupon today. This will bring you, without obligation, the *complete* story on *all* Lovejoy products. The new catalog has complete specifications, line drawings, prices, hints on grinding, parts numbers, etc., etc.—it will help solve wartime production problems, and help on post-war planning.

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TOOL COMPANY, Inc., SPRINGFIELD, VT., U.S.A.

HANDY ANDY *Says*—

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

LT. Sverre Jorgensen, home on furlough after some 50 bombing missions over Hitleria, dropped in just as I was jotting down the preliminary notes for the Column. And, thereby, quite changed my trend of thought.

Superficially, the young pilot is the same happy-go-lucky but purposeful stripling who, a few short months ago, was our blueprint boy at Midland Steel. But, under his be-ribboned tunic (oh, he's won his medals!) one senses the battle tested veteran. A boy went to war, a man returns.

▼ ▼ ▼

They don't all come back. One by one, bringing the war ever closer to home, close friends and acquaintances with sons or near of kin in the Services receive fateful news. Then, one reads in saddened faces the emptiness that comes to the heart. And, even as quick sympathy leaps to expression, one checks the utterance lest, in clumsy words, one profane the sanctuary of sorrow—the retreat within oneself. Instead, there is somehow conveyed a tacit message, and the bereaved heart understands.

Yes, young Sverre changed my trend of thought—rather, crystallized what had long been revolving in my mind. For, he not only typifies American youth at its best, but epitomizes its outlook on the future as war will shape it.

▼ ▼ ▼

Beneath a thin veneer of sophistication and superficiality, American youth, be it in the arena of war or on the home front, is serious minded and objective. Stripped of illusions, our young people are far better equipped to shape the world of tomorrow than their elders were to shape the world of today.

Yet, in all fairness, it must be said that they have the advantage of today's experience. For even as we, in our own field of engineering, have superseded cut-and-try with scientific approach to the techniques of mass production, so youth can predicate the future on the lessons learned by the people of the present age.

We, too, built on the foundations laid by our sires, and the best that we have today had its genesis in yesterday. It just happens that, at no time in world history, has material progress had such acceleration.

From my talk with the young pilot—and with other soldiers—I gather that strikes in industry don't go over with the boys at the front, and that resentment is going to have a considerable bearing on future industrial relations.

Irresponsible labor leaders who, during the emergency, have put their own selfish interests ahead of the nation's needs may face a strict accounting "when the boys come home".

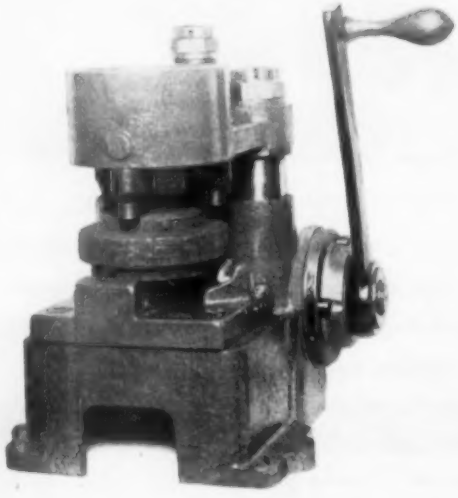
I also gather that, on demobilization, the boys will demand and secure work at gainful wages. They will insist on becoming economic assets. Well, that is their right. They have richly earned a place in the economic sun.

One thing that I see is a general spiritual awakening, this despite that alarmists point to demoralization and growing juvenile delinquency. Well, wars have ever sapped the moral fibre of the weak, and, on the face of things, we'll have to concede the increase in juvenile delinquency. But, this sub-rosa element is still an insignificant minority, publicized because crime, not decency, is sensational.

▼ ▼ ▼

Your children, and mine, are not in that minority. The majority is responsible, has moral stamina. In this connection, I was quite interested in recent comments by Brad Peirce, our (soon to be stepped up) 3rd. vice president. Brad, it seems, is investing in youth, with confidence in its integrity.

(Concluded on page 196)



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AN APPLICATION SHOWING MERITS OF THE LS TYPE FIXTURE. ROUND PARTS CAN BE HELD AGAINST HEAVY DRILL TORQUE BY MAKING DRILL PRESSURE HELP THE CLAMPING. STEEL INSERTS SET ON ANGLE GRIP PARTS; WHILE TOP PLATE AUTOMATICALLY FOLLOWS UP ANY LOWERING OF THE WORK.

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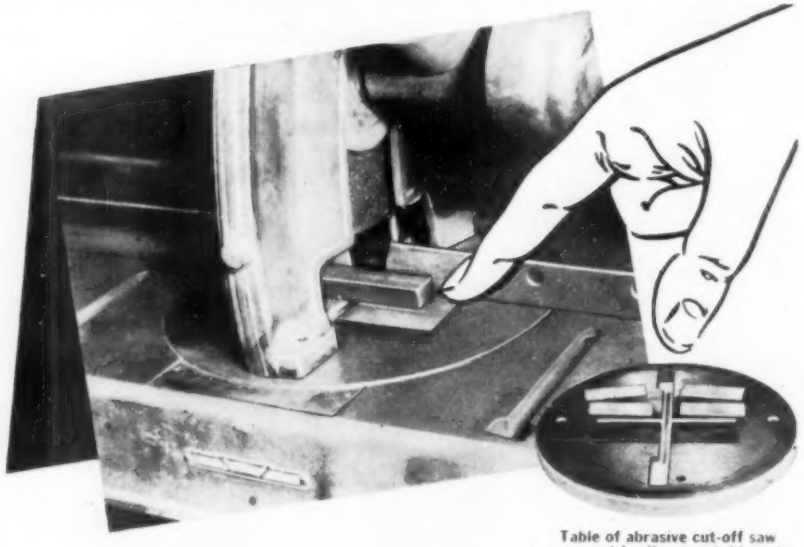

Table of abrasive cut-off saw recessed for Kennametal inserts

. . . AND PROVIDE A NEW SURFACE THAT OUTWEARS THE ORIGINAL UP TO 100 TIMES

The effective life of many types of machines can be lengthened, and costly shutdowns eliminated, by using Kennametal at strategic points. The illustrations of the abrasive cut-off saw clearly show how standard Kennametal blanks, made primarily for cutting tools, can be used as wear-resistance units. The original surfaces of the saw rest wore quickly, allowing the steel to wobble, causing uneven cut-off. Kennametal inserts, recessed into the table, make a smooth, hard surface of unsurpassed durability.

● The superiority of Kennametal for "specialty" applications comes from a combination of unique properties —amazing hardness (78 Rockwell C), low coefficient of friction, high modulus of elasticity (2 to 3 times that of steel), dimensional stability, and resistance to corrosion and erosion.

Kennametal is available in standard shapes (flat blanks, discs, balls), or it can be accurately molded into special shapes, limited only by reasonable proportions. You can use it profitably in your products, and production machinery. Tell us your wear problem. We will suggest how it may be solved with Kennametal.

—HANDY ANDY SAYS—

(Concluded from page 194)

Well, he's not alone in that; yet, it is significant that leaders in industry, and in their respective communities, are willing to back their faith in America's youth with tangible substance.

The first World War inaugurated an era of disillusionment and iconoclasm, with world thought muddled by false prophets and self appointed gods. As a result, there has been depreciation of human as well as moral values.

Well, all that is changing, although I don't believe that the swing will be toward the rigorous severity of Puritanism. But, from letters from my own kin, boys with whom I am intimately acquainted, I read a definite trend toward religion.

▼ ▼ ▼

As one boy said, "You know, when you hear the whisper of death as bullets whiz past, it makes you think. And you like to feel that, even when you are alone, that there is Someone with you."

Well, our boys go to war, and many have fallen even as many more are destined to find their final rest in foreign soil. Now then, are these boys to die like animals, without hope, without a goal to which they may aspire, without a Rock to which they may cling in the final moment? I can't see it.

Assume, for the sake of argument, that there is no hereafter, that it's all a figment of the imagination created by fear of the unknown. What matter, if in the final analysis it becomes utterly real because of faith? Faith spells the difference between hope and despair.

Then, there are the parents to consider, the close of kin, the wives and children of our fighters. Is the fateful message to be a note of finality—"this is the end". Or, is it to be a promise of future reunion, an open Sesame to the "door that has no key"? I can't answer the question. The answer is in your own heart, even as it is locked in the breasts of the Unknown Soldiers of America and France, of Italy and Germany, and the Unknowns of all lands where men have died for what, at the moment, they believed was the right.

▼ ▼ ▼

It all boils down to what a literary critic once told me, but anent something else entirely: "You, or someone you know, may not believe in God, but as long as the majority believes, He goes over."

And as long as man has sought the riddle of the Great Unknown he has aspired to a spiritual haven—to Valhalla and Paradise, to Nirvana and Heaven, each to his own belief. If there is faith, then, there is also reality—for them that believe.

Oh, sure, the theme is hardly technical. Neither is Christmas. But, to the heart that is heavy with loss—and it is for the heavy of heart that this is written—it may strike a responsive chord.

As we approach the day that is dedicated to peace on earth and good will to men, it expresses the tacit message that the lips were constrained from uttering. Let it stand.

THE END

Detroit manufacturer* of aircraft parts increases production 450%

They used to hone one bushing per minute—and then they had to stop and clean out left-over abrasive. Now they finish-ream 4½ bushings per minute, to mirror-smooth finish and close tolerances, in only **one** operation! The Lempco Expansion Reamer has many time-saving features. Blade segments easily removed and resharpened, or replaced when worn out. Flutes spiral in opposite directions simultaneously, eliminating chatter and producing a perfect finish. Good delivery. ***Write for catalog.***

SPECIAL REAMERS DESIGNED
TO MEET YOUR NEEDS
SEND BLUEPRINTS

* Name on request

hardened bushings...

4½ per minute instead of only 1 per minute

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Two-Direction
SPEED CONTROL VALVES

HERE is the solution to cylinder speed control problems. A Hanna Two-Direction Speed Control Valve controls piston speed in both directions. Installed between the operating valve and one end of a cylinder, it provides adjustable control of inflow as well as exhaust of the air independently to and from one side of the piston.

The valve body is cadmium plated and all other parts are made of corrosive resistant materials. Built for 250 lbs. maximum pressure, it is available in ⅛", ¼", ⅜", ½", ¾" and 1" pipe sizes. Write for details.

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RIVETERS • CYLINDERS • AIR HOISTS

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Matthews "Safe-Hed" Steel letter and figure stamps . . . used for 90% of industrial stamping needs . . . are available from stock in a complete range of sizes. Stamps with two or more characters, symbols or designs made to order for marking flat, concave or convex surfaces.

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APPLICATIONS

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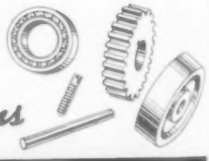
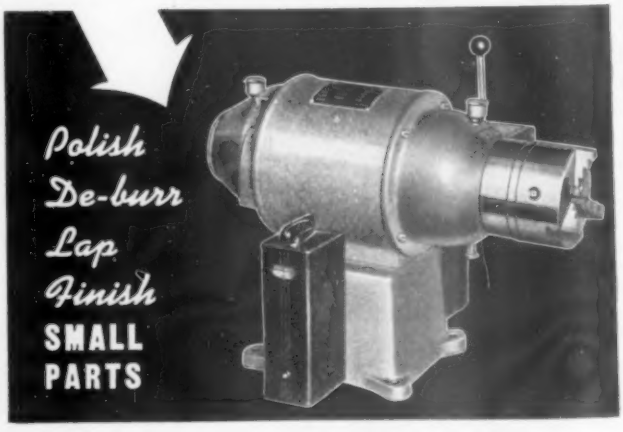
902 PAYSON ROAD LOGANSPORT, INDIANA
Manufacturers of Air & Hydraulic Devices, Chucks, Cylinders, Valves, Presses, Accessories

SPEED LATHES
for Secondary Operations



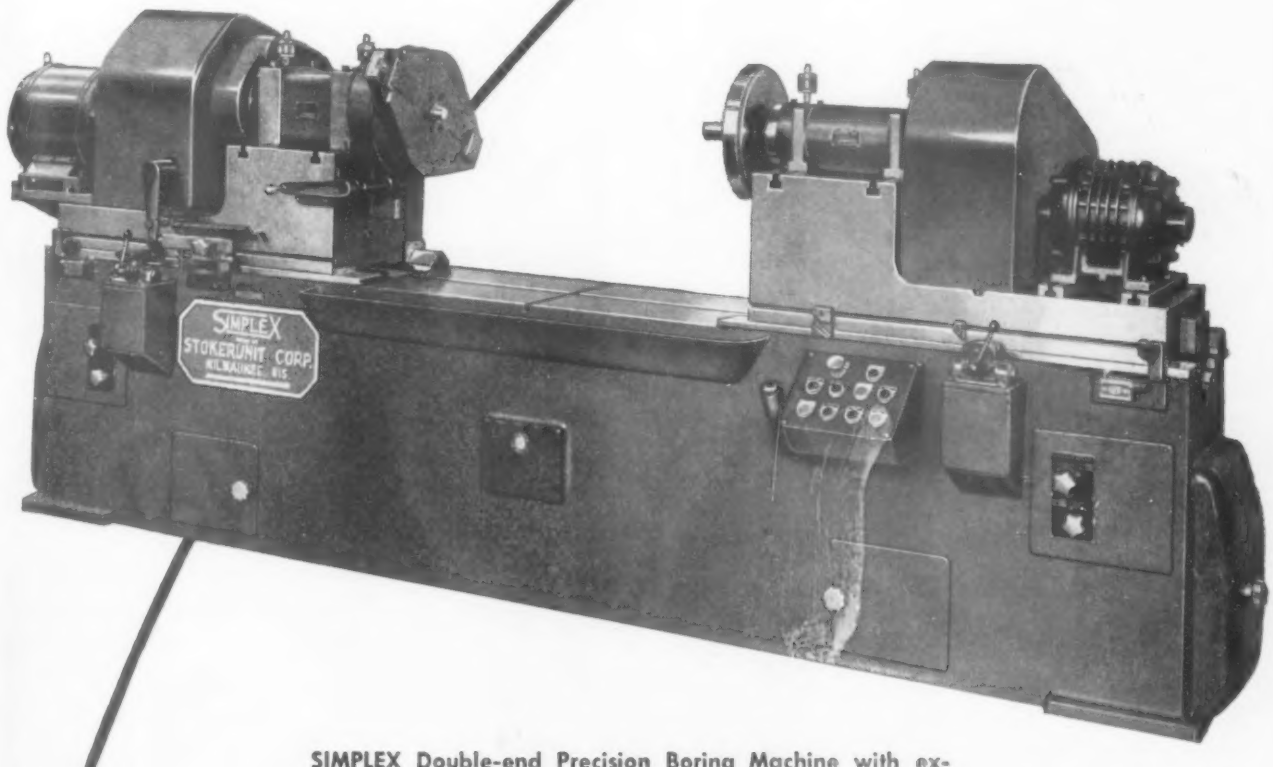


Schauer Ideal Speed Lathes insure finer quality, greater accuracy and uniformity, coupled with increased output and lower cost. A size and type for every finishing purpose. State YOUR finishing problem. Write for Catalog 440.

SCHAUER MACHINE COMPANY
ORIGINATORS OF TODAY'S SPEED LATHES
2066 READING ROAD — CINCINNATI 2, OHIO

SIMPLEX

When it became necessary to apply mass production methods to a large, intricate assembly, final finishing operations had to be performed after the assembly unit was completed. The operation was slow and difficult until a SIMPLEX Precision Boring Machine was engineered to do the work. This is another example of the flexibility and versatility of SIMPLEX Precision Boring Machine construction.



SIMPLEX Double-end Precision Boring Machine with extended center bed section, arranged for boring and facing bulky assemblies which required a high degree of parallelism between the faces and a high concentricity between the bores and the opposite ends of the assembly.

Precision Boring Machines

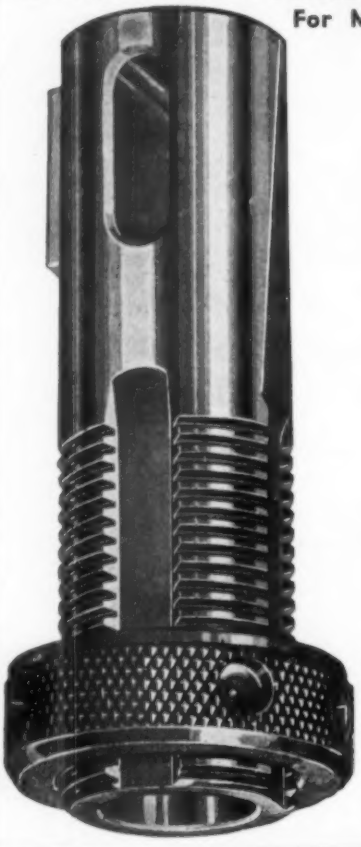
STOKERUNIT CORPORATION

SIMPLEX Precision Boring Machines and Planer Type Milling Machines

4528 West Mitchell Street, Milwaukee 14, Wisconsin

GLENZER ADJUSTABLE ADAPTERS

For Multiple Spindles



STANDARD EQUIPMENT FOR ALL DRILLING REAMING AND TAPPING MACHINES.

ADOPTED AS STANDARD BY LEADING AUTOMOTIVE AND MACHINE TOOL MANUFACTURERS

Utility Tools

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SAWS and FILES
METALS • WOODS • PLASTICS

Fits any ¼" Electric Drill, Air Drill or Flexible Shaft.
Chucks in Drill Chuck or Collet.
Uses Ordinary Hack Saw Blades and Standard ¼" Shank Machine Files.
Easily Used in Difficult Places.

A Speedy, Accurate, Powerful Saw that is an essential tool for every metal or wood worker, machinist and mechanic.

All rotating parts are Ball Bearing and run in oil—no gears—no cams—always smooth running. Saw chuck holds firmly and aligns saw perfectly. A WYCO Guaranteed Tool—Send for Catalog on Complete Line of WYCO Profit Producing Tools and WYCO Flexible Shaft Equipment.

$35.00 Complete, with extra saw blade and ¼" round machine file.

Distributed Only Thru Jobbers

WYZENBEEK & STAFF, Inc.

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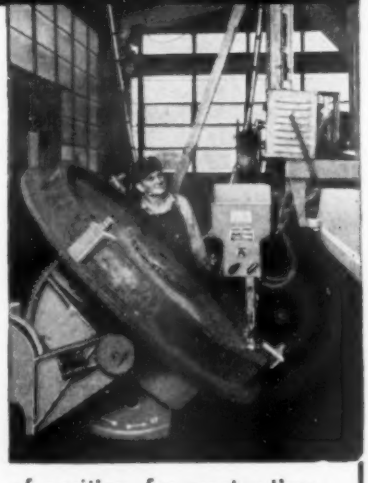
C-F POSITIONERS



WHEN "POSITION" COUNTS MOST

On automatic welding jobs, like the one illustrated here, position counts "most", and with the C-F Positioner (with 6 sizes, and capacities to 30,000 lbs.) the tables tilt to 135° beyond horizontal and rotate 360°, all under push button control. The exclusive C-F Variable-Speed Control gives table rotations ranging from 0 R.P.M. up for all sizes. For "quick change" of position, for greater time saving and efficiency, for lower costs and greater safety to men and materials, specify C-F Positioners for all ***automatic*** and production welding operations.

Write for Bulletin WP-22

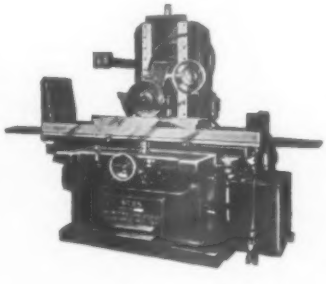
CULLEN-FRIESTEDT CO.

1318 S. Kilbourn Ave. Chicago 23, Ill.

SPEED & PRECISION

with

Grand Rapids Hydraulic Feed Surface Grinders



While keeping pace with the Defense Program Grand Rapids Grinders are maintaining the features that have made them one of the leading machine tools of the Nation.

One piece base and column insure accuracy at high speeds attainable on all Grand Rapids Grinders.

Write for Catalog GL-100

GALLMEYER & LIVINGSTON CO.

110 Straight Ave., S. W.
GRAND RAPIDS 4, MICHIGAN

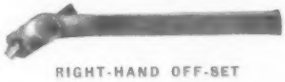
ARMSTRONG
ARMIDE
Carbide TOOL SETS

CARBIDE-TIPPED TOOLS FOR EVERY DAY OPERATIONS

ARMIDE TOOL SETS simplify many every-day jobs in tool rooms, shops and maintenance departments. They are standard, multi-purpose tools which offer special advantages on machining operations involving: (1) Long runs, (2) High speed operation, (3) Cast iron, (4) Tough alloy steels, (5) Non-metallics, (6) Hardened parts (obviate need for annealing and re-hardening).

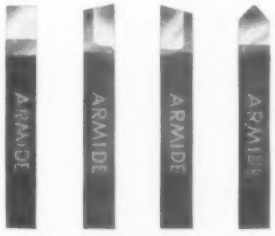
STRAIGHT SHANK

LEFT-HAND OFF-SET



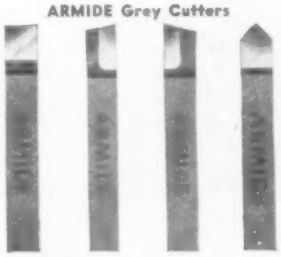
RIGHT-HAND OFF-SET

ARMIDE Red Cutters



Square Nose | L.H. Off-Set | R.H. Off-Set | 80°

ARMIDE Grey Cutters



Square Nose | L.H. Off-Set | R.H. Off-Set | 80°

Each set comprises: 3 ARMSTRONG Carbide TOOL HOLDERS, 8 ARMIDE Carbide-Tipped Cutters — 4 ARMIDE Red, for machining steel and 4 ARMIDE Gray, for machining Cast iron, brass, bronze, aluminum and non-metallics; with service wrench in a fitted steel cast. (as illustrated).

Write for Bulletin—C844.

ARMSTRONG-ARMIDE Sets are stocked by leading Industrial Distributors in 4 sizes.

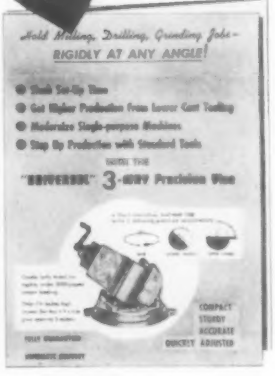
ARMSTRONG BROS. TOOL CO.
"The Tool Holder People" 360 N. Francisco Ave., Chicago, U.S.A.
Eastern Warehouse & Sales: 199 Lafayette St., New York

Thousands
OF SET UP-HOURS *Saved* EVERY DAY WITH "UNIVERSAL"

3 way Angle set Vises

Here's what hundreds of users tell us. *"In the time it takes to find clamps, bars, parallels for ordinary set-ups—the job is ready for machining with the "UNIVERSAL" Angle-Set Vise."* Reports of savings of ⅓ to ½ set-up time come from plants large and small from coast to coast.

This Circular Tells How



It contains the full facts about the "UNIVERSAL" Vise. Complete specifications, job application sketches, how "UNIVERSALS" simplify tool bit grinding, names of users and other informative data.

Heads of Tool Rooms, Machine Shops, Repair and Assembly Departments have found this material valuable. Scores of prominent manufacturers have distributed thousands of copies of this circular to Department Heads and Branch Plants.

Ask us for your FREE Copy.

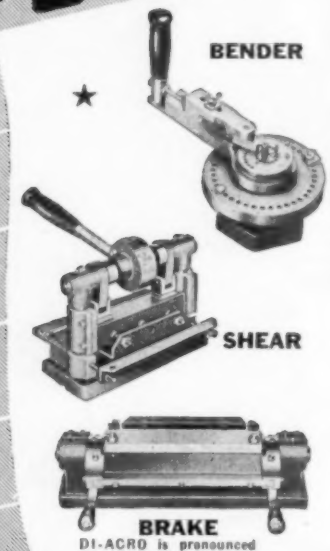
UNIVERSAL VISE & TOOL CO.
131 Main Street PARMA, MICH.

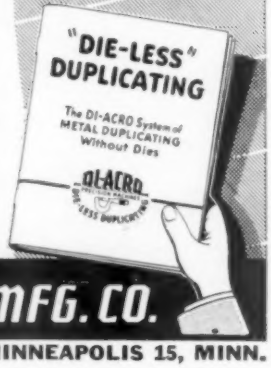
"DIE-LESS" DUPLICATING

SAVES MAN HOURS AND DELAYS

DIE ACCURACY WITHOUT DIES

Send for CATALOG





DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

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The first installment of HOBART'S ARC WELDING DESIGN service is—

A really practical idea service—ideas that are readily adaptable to your use—ideas that will help you use arc welding to best advantage. Write today, we will gladly send you this service.

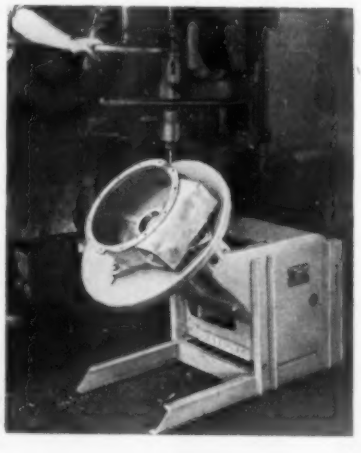
HOBART BROTHERS CO.
Box TE-124, Troy, Ohio

HOBART *Simplified"* arc welders

"One of the World's Largest Builders of Arc Welders"

WORK POSITIONING

The Means to Cutting Costs and Boosting Production



Work accessibility in any manufacturing process means lower costs, greater efficiency, better quality, and increased production . . . Ransome Positioning Equipment is widely used for tilting and turning a great variety of products, so that workmen can do their jobs more easily and better.

If work simplification is your problem, investigate this equipment . . . it will pay dividends

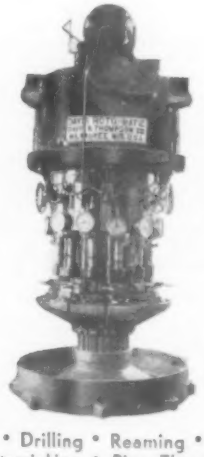
INDUSTRIAL DIVISION Ransome MACHINERY COMPANY

DUNELLEN, NEW JERSEY

SUBSIDIARY OF WORTHINGTON PUMP AND MACHINERY CORPORATION

ROTO-MATICS

Insure maximum production because they are continuous in operation. Both vertical and horizontal, multiple-spindle types in wide range of sizes are available for your job.



Milling • Drilling • Reaming • Boring
Countersinking • Pipe Threading

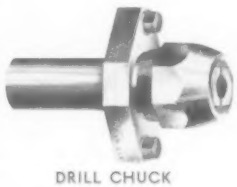
DAVIS & THOMPSON CO.

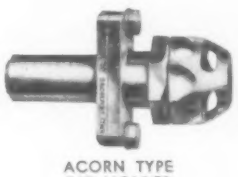
Mfgrs. of Machine Tools & Micrometers

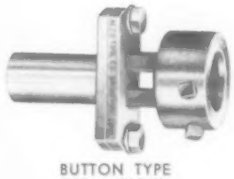
MILWAUKEE 14, WIS.

ALCO

You can completely equip your screw machines with ALCO tools for every drilling, tapping, reaming and thread cutting operation and get more and better production at less cost because . . .


DRILL CHUCK


ACORN TYPE
DIE HOLDER


BUTTON TYPE
DIE HOLDER

TAP HOLDER

1. No bushings are needed. Drills and taps are held securely. No time lost in making special size bushings.
2. Change the drill or tap size without changing the chuck . . . each ALCO holder will accommodate several sizes.
3. Accurate concentricity is accomplished and guaranteed by the special Alco adjustment.
4. Taps and dies last longer because of the concentric alignment.
5. Every thread cut perfect, no taper threads, no rejects — each one die-true.

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ALCO EFFICIENT TOOLS

THE ALCO TOOL CO., 453 Birdseye Street, Bridgeport, Conn.
Detroit Office: 908 Stephenson Bldg., Phone Madison 5870
Chicago Office: 6219 So. Kenwood Ave., Phone Hyde Park 6807

CIRCLE "R"

METAL CUTTING SAWS

NO WONDER THEY'RE GOOD

This company has been making circular metal cutting saws since 1923, when it was founded, and all its officers and employees were experienced saw makers for a long time before that. Almost all of our factory space, 20,000 square feet, is devoted to this one product.

So it is a fair assumption that we "know" circular saws. In fact we *have* to, because our reputation depends chiefly on this one product. No wonder circle "R" saws are good!

Have you tried them? If not, send for our Catalog K.

PRECISION CONTROL

of manufacturing is another reason why Circle "R" saws are good. Our modern heat treating ovens have potentiometric control, — the most accurate method for the purpose.

CIRCULAR TOOL CO., Inc.

PROVIDENCE 5, R. I.
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INDIANAPOLIS · ST. LOUIS · LOS ANGELES

THE PASSING PARADE

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

THE EVER-CHANGING SCENE IN MASS MANUFACTURING

Marine Department—J. C. Rengel and T. P. Eldridge have been named to head up two special sections of Marine Department, Western Electric and Manufacturing Company, Charles B. Weaver, Department Manager, reports. Rengel will manage the newly-formed Navy Section and Eldridge will manage the Merchant Marine Section. H. E. Grout, Manufacturing Manager, will direct all Small Motor factory operations. N. H. King will be Manager of Production Planning, C. S. Shutt, Manager Lima Small Motor Division, said.

A century of service is represented by these three, employees of Brown Instrument Company, Minneapolis-Honeywell Regulator Company. Left to right are Herbert Bohle, Earl D. Nuneviller and Earl M. Robinson. Robinson and Nuneviller served in World War I.

Continental Changes—Important personnel changes at Continental Can Company, Inc., include the following: Price R. Reid has been named Assistant Division Manager of Operations, Eastern Division. He was General Manager, Concan Ordnance Company, recently dissolved subsidiary. J. E. Wolfe, General Manager, Molded Plastics Division, reports the elevation of E. R. Brodeen to Plant Manager; V. E. Robbins, General Accountant; K. W. Bromley, Chief Engineer, and W. E. Crowther, Personnel Manager. J. Roger McManus was again appointed Oil City Factory Manager. G. W. Crabtree will be Factory Manager at the Jersey City plant.

Bendix Reshuffles—Frank B. Willis, former Sales Director, has been named to manage all Bendix Products war contract terminations. He will be succeeded by Allen C. Chambers. Roy T. Hurley has been elevated to Vice President and has been assigned special Bendix Aviation Corporation problems of conversion, according to Ernest R. Breech, President, who also reported appointment of T. W. Tinkham as General Manager, Eclipse Machine Division.

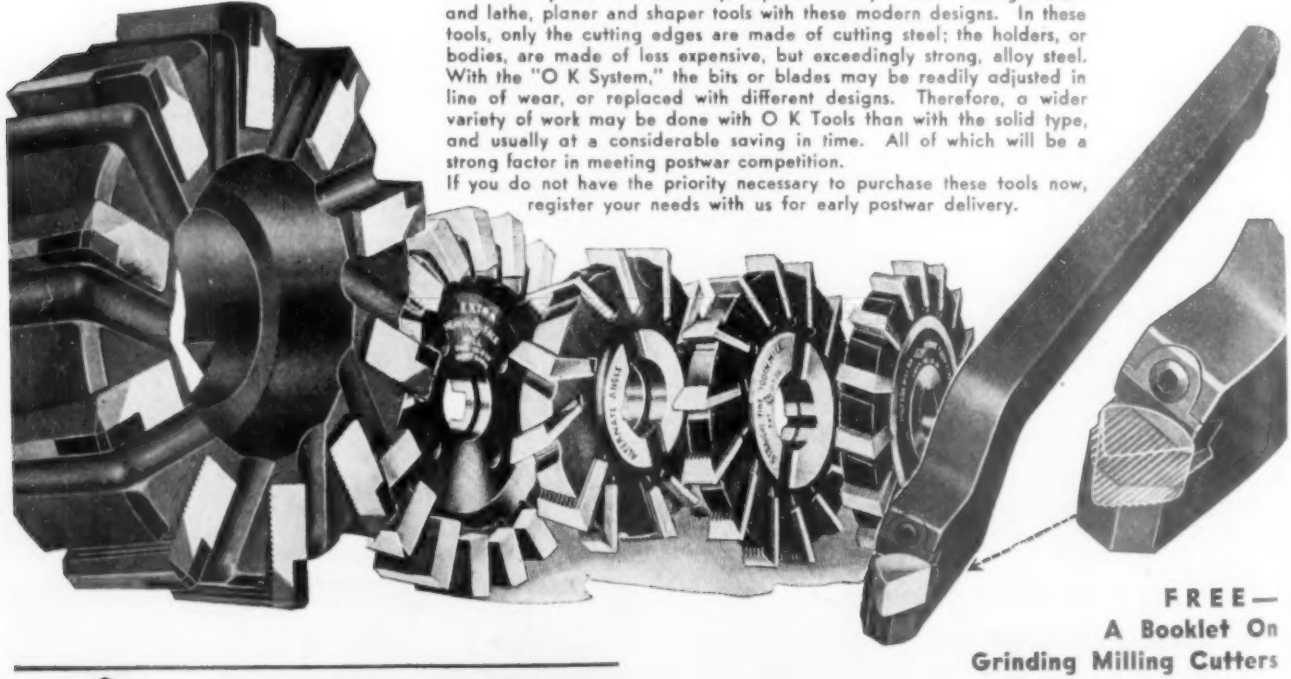
(Continued on page 214)

POSTWAR COMPETITION WILL BE SEVERE

Set Up For It Now With OK Tools

For extra speed and economy, replace old-style solid milling cutters and lathe, planer and shaper tools with these modern designs. In these tools, only the cutting edges are made of cutting steel; the holders, or bodies, are made of less expensive, but exceedingly strong, alloy steel. With the "O K System," the bits or blades may be readily adjusted in line of wear, or replaced with different designs. Therefore, a wider variety of work may be done with O K Tools than with the solid type, and usually at a considerable saving in time. All of which will be a strong factor in meeting postwar competition.

If you do not have the priority necessary to purchase these tools now, register your needs with us for early postwar delivery.



FREE—
A Booklet On
Grinding Milling Cutters

TRADE OK MARK **SYSTEM**
OF INSERTED-BLADE METAL CUTTING TOOLS

THE O K TOOL CO., SHELTON, CONN.

Precision —

THE DISTINGUISHING QUALITY OF SOUTH BEND LATHES

It is for their high precision that South Bend Lathes are best known. Their dependable accuracy has made them first choice for the most exacting work in hundreds of essential war production plants. Finish turning and boring operations are often performed with such exactness that subsequent grinding, honing, or lapping is unnecessary.

In war production, there is no place for equipment that can not hold required tolerances or deliver maximum output. Investigate the possibilities of South Bend Lathes for handling your exacting jobs with greater efficiency. With them, you will find it easier to maintain precision tolerances on toolroom and production operations.

South Bend Engine Lathes and Toolroom Lathes are made in 5 sizes: 9″, 10″, 13″, 14½″, and 16″ swing. Precision Turret Lathes made in 2 sizes: Series 900 having 9″ swing with ½″ collet capacity, and Series 1000 having 10″ swing with 1″ collet capacity.

NEW CATALOG NOW READY

Write For It!

Illustrated in full color — showing all types and sizes of South Bend Lathes. Ask for Catalog No. 100-D.

Lathe Builders For 38 Years

SOUTH BEND LATHE WORKS

E. Madison St. • SOUTH BEND 22, INDIANA

Specialty Steels—Customer needs for postwar specialty steels prompts Allegheny Ludlum Steel Corporation to shuffle personnel. V. B. Browne, Vice President and Technical Director, reports C. A. Scharschu, Research Director, has made the following appointments: Dr. Gurdon M. Butler, Denver-born graduate of M. I. T., Tool and Die Steel Division; Dr. Gunther Mohling, Munich University graduate, High Temperature Alloy and Valve Steel Division; Dr. R. A. Lincoln, Carnegie graduate, Stainless Steel Division; and long-time company employee George C. Kiefer, Corrosion and Coatings Division. All will have the title, Metallurgical Engineer and Associate Director of Research, except Kiefer who will be Chemical Engineer.

G. M. Butler

R. A. Lincoln

Further Duties—Clarence W. Avery, President and Board Chairman, Murray Corporation, has been elected to the Michigan Bell Telephone Company Board of Directors.

Officials Resign — Vice Presidents Frank J. O'Brien and Eugene J. O'Connor have resigned from Continental Can Company, according to Carle C. Conway, Board Chairman and President. O'Brien has been with Continental since 1928 and O'Connor has been with the firm in various capacities many years.

Personnel Changes — Positive planning for sustained tempo in postwar business has brought changes in key personnel at Reliance Electric Engineering Company, Cleveland. Clarence L. Collens, for 37 years President, has been elected to the newly-created post of Chairman of the Board. He will be succeeded as President by James W. Corey, Sales Vice President since 1940. H. M. Hitchcock, Treasurer and Senior Vice President, retires December 31 to be succeeded by A. M. MacCutcheon, now Engineering Vice President. Also resigning is C. V. Putnam, Secretary. His successor will be Roscoe H. Smith, who will continue duties in the Sales Promotion Department.

Motor Products—Motor Products Corporation reports through President A. L. Lott that L. G. Jacques, a vice president, has been named General Manager. H. G. Brush, Treasurer, has been elevated to a vice presidency.

Industrial Engineers— J. R. Cramer and F. J. Titler have become Assistant Chief Industrial Engineers, Republic Steel Corporation, Cleveland.

Eastern Manager—Abrasives producer, Carborundum Company, reports appointment of W. T. McCargo as Eastern Regional Sales Manager to succeed F. Jerome Tone, Jr., recently elevated to Vice President. McCargo recently returned after serving as a consultant for the federal government in abrasives.

J. H. Blake

W. T. McCargo

Research Director—Seeking commercial products outside the aircraft field, Glenn L. Martin Company has engaged J. Howard Blake as Market Research Director for non-aeronautical divisions of the company.

Design Engineer—Industrial designer and stylist Willis Ahlborn Kropp has joined Aircraft Parts Development Corporation, Summit, N. J., reports D. C. Hungerford, President. The firm plans broadened activity in application of plastics and powdered metals. Kropp has a reputation as a designer.

(Continued on page 216)

"ROCKWELL"
HARDNESS TESTER

Immediate shipment of this new J Model in any of four sizes

WILSON
MECHANICAL INSTRUMENT CO. INC.
373 CONCORD AVENUE
NEW YORK 54, N. Y.

AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.

with an Eye to the FUTURE

Gusher Pumps Patented and Patents Pending

Model 11020-A

The Ruthman engineering staff are continually conducting experiments and research toward new developments and improvements in

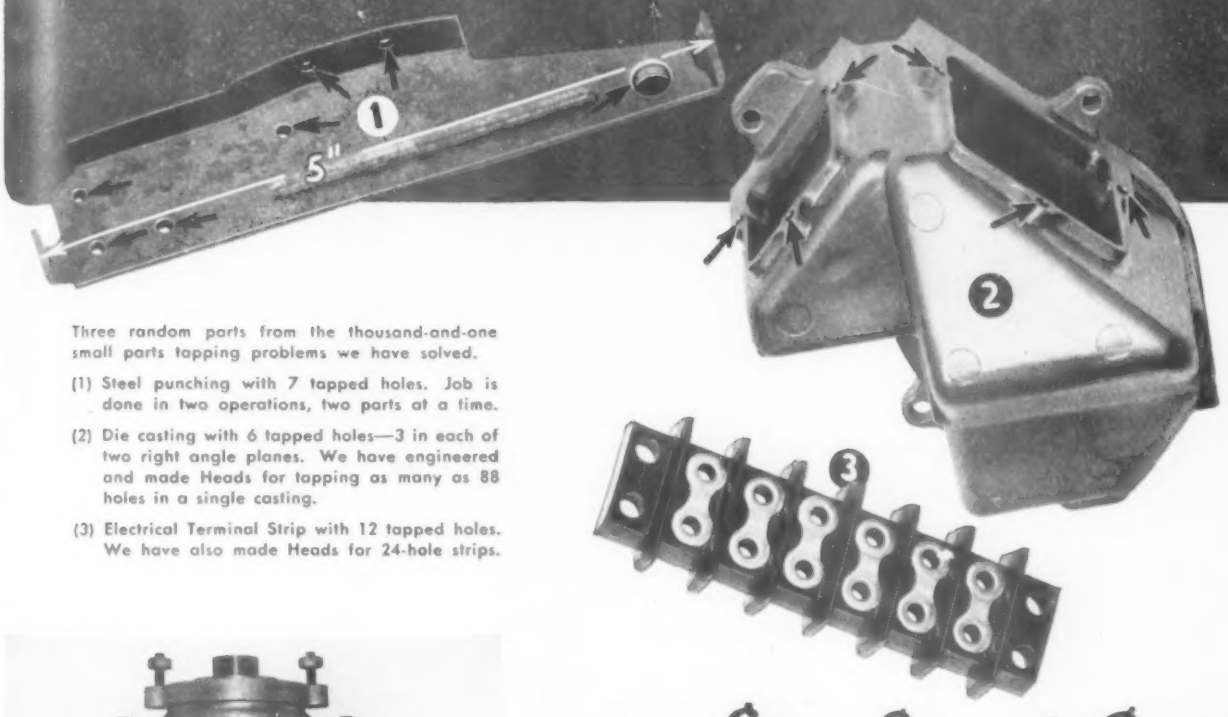
GUSHER
COOLANT PUMPS

The new models are so advantageous in operation that many plant engineers have re-designed or are re-designing their machine-tools to include them. By actual test these newer type Ruthman pumps have *proven* their superiority.

Write for new catalog, indexed for ready reference. Remember, there is a Gusher model and type for your special needs.

THE RUTHMAN MACHINERY CO.
1815 READING ROAD CINCINNATI 2, OHIO
The "Gusher"—A Modern Pump for Modern Machine Tools

THE FAST, LOW-COST WAY TO TAP SMALL PARTS - - - like these - - - -

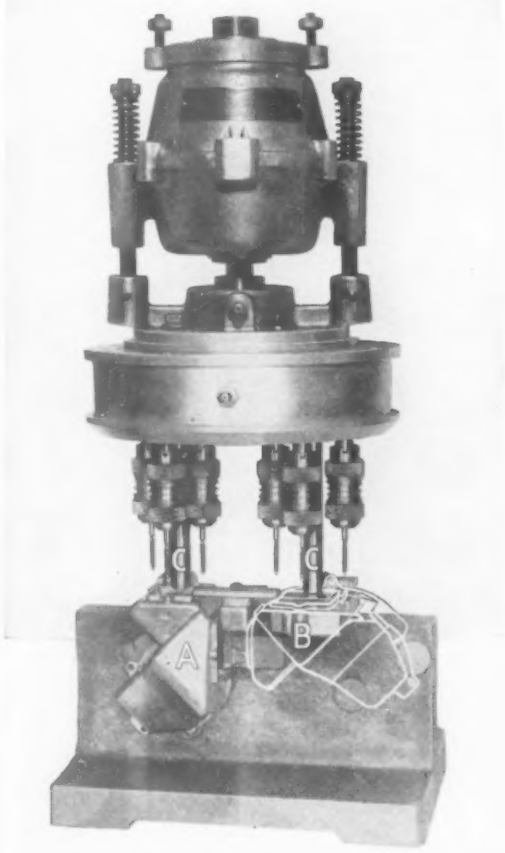


Three random parts from the thousand-and-one small parts tapping problems we have solved.

(1) Steel punching with 7 tapped holes. Job is done in two operations, two parts at a time.

(2) Die casting with 6 tapped holes—3 in each of two right angle planes. We have engineered and made Heads for tapping as many as 88 holes in a single casting.

(3) Electrical Terminal Strip with 12 tapped holes. We have also made Heads for 24-hole strips.



This is the complete Head for part 2 above. Parts are progressively fed from position A to B, three holes being tapped at each position, at the same time, in two different planes. Parts are simply laid over horns and are automatically positioned and held in place by locators C, C, when spindles are fed. Simple, fast and fool-proof.

The Ettco-Emrick System of MULTIPLE SPINDLE HEADS

Figuring out the way to handle small parts to get **highest tapping production** is a specialized engineering job. The Ettco-Emrick System of Multiple Tapping Heads is the result of many years of specialization in this field.

This system provides a selection of a dozen different standardized methods for obtaining the fastest production on a wide variety of shapes and sizes of parts, and number and spacing of holes.

Each Head is specifically engineered for a particular part. Fast loading, automatic clamping and unclamping are built-in features. All parts of the Head are tied together with guide posts similar to a punch and die.

Heads can be used on any drill press. The set-up is simply a matter of clamping the Head onto the press—any shop man can do it.

BEFORE you decide on how you are going to do any small parts tapping, consult Ettco-Emrick. Engineers of many leading manufacturers are doing this regularly. They have learned it saves them time, money and headaches.

ETTCO TOOL CO.

586 Johnson Ave., Brooklyn 6, N. Y.

Detroit 1 • *Chicago 6*

Over 25 years specialization in solving industry's drilling and tapping problems

Truck Distributor— Dodge Division, Chrysler Corporation, announces appointment of John J. Dunn, former Providence, R. I., resident, as Truck Distribution Manager. F. H. Akers, Vice President, reports Dunn has recently been connected with the tank building program.

W. P. Mitchell

J. J. Dunn

Assistant Engineer—William P. Mitchell becomes Assistant Chief Engineer, Mack Trucks, Inc., according to L. C. Josephs, Vice President and Chief Engineer. Mitchell has just returned from England where he served as military truck transport advisor. Graduate of Pennsylvania University, he was a World War I officer.

Treasurer Promoted—Morris F. LaCroix, Treasurer and a director of Copper Range Company, Boston, has been elected President to succeed William H. Schacht, deceased. Philip F. Beaudin will serve as Treasurer and Vice President.

Heat Exchangers—Reorganizing forces for postwar expansion, Drayer & Hanson, Inc., Los Angeles, reports through President R. E. Ristow four appointments of interest: Albert Hanson has been named Vice President in Charge of Engineering; J. C. Lombardi will be Vice President and Director of Sales; Scott M. Hauser, Vice President, will add duties as Director of Sales Promotion and Advertising; and A. H. Witt will be Sales Manager, Air Conditioning and Refrigeration. The firm manufactures heat exchange equipment.

Graduate Professor — University of Pittsburgh reports appointment of Dr. Alexander J. Allen as Westinghouse Graduate Professor of Engineering according to Dr. John G. Bowman, Chancellor. Pittsburgh permits study for advanced degrees through a cooperative plan with Westinghouse Electric and Manufacturing Company.

Acting Manager— Succeeding A. E. Heath, who is assuming other duties, Roy Schoonfield becomes Acting Manager of the branch of Gar Wood Industries, Inc., according to W. H. Hammond, Vice President.

Official Elevated—A. J. Gray, President and General Manager, Crescent Brass and Pin Company, announces promotion of J. C. Alpeters to Vice President. Alpeters has been Treasurer and Sales Manager. Frank E. Breen has been elected Secretary.

Board Election—L. Boyd Hatch, Executive Vice President and a director of Atlas Corporation, has been elected to membership on the Graham-Paige Motors Corporation's Board of Directors. Joseph W. Frazer, Graham-Paige Chairman, made the announcement.

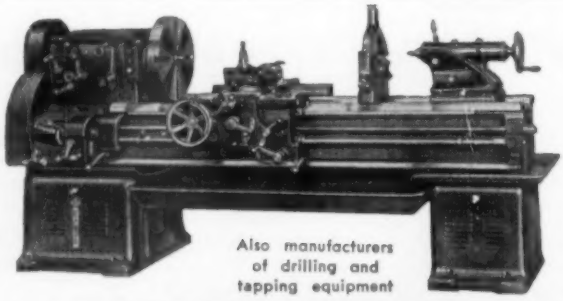
General Manager—Detroit's Guardian Steel Company reports appointment of C. W. Garvey as General Manager. Garvey most recently was with the WPB in the Iron and Steel Branch.

R. B. Jones

P. A. Mead

Customer Service—Improved customer service is sought by Osborn Manufacturing Company in recent personnel changes which promoted R. B. Jones to help in scheduling production and shipments. Page A. Mead, Market Development Assistant, will replace Jones in the Cleveland area, according to M. C. Pecsok, Sales Manager, who reports the changes.

(Continued on page 218)

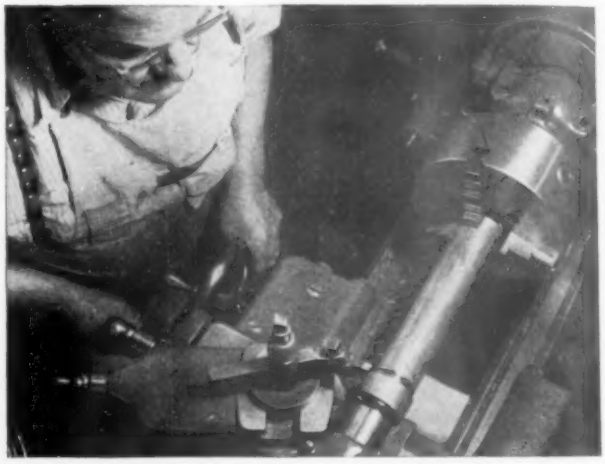


AT YOUR COMMAND
IN
THE METALMASTER

★12 speeds available in both forward & reverse directions.
★Simplified controls; perfectly-balanced spindles; gears of heat-treated alloy steel.
★Range of threads and feeds is infinite; power is ample.
★Deep, braced walls prevent springing under heavy load.

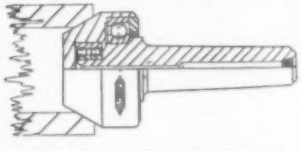
1840 - 1944

THE BRADFORD MACHINE TOOL CO.
EVANS STREET SOUTH OF EIGHTH CINCINNATI, OHIO
PRECISION TOOLS SINCE 1840



LIVE CENTER *adapted to tube turning*

The basic design of the STURDI-MATIC Live Center is ideally adapted to tube turning . . . extra large sections are no problem with this set-up . . . in most of these cases (see mechanical drawing) there is a tool clearance. . . . Characteristic of all STURDI-MATIC design is this low overhang which together with a slight cushioning action, that compensates for expansion, due to heat, shock and excessive thrust loads—reduces wear to a minimum . . . we will see that your job gets set-up with the right LIVE CENTER. . .



Special LIVE CENTER for turning extra large tubing.

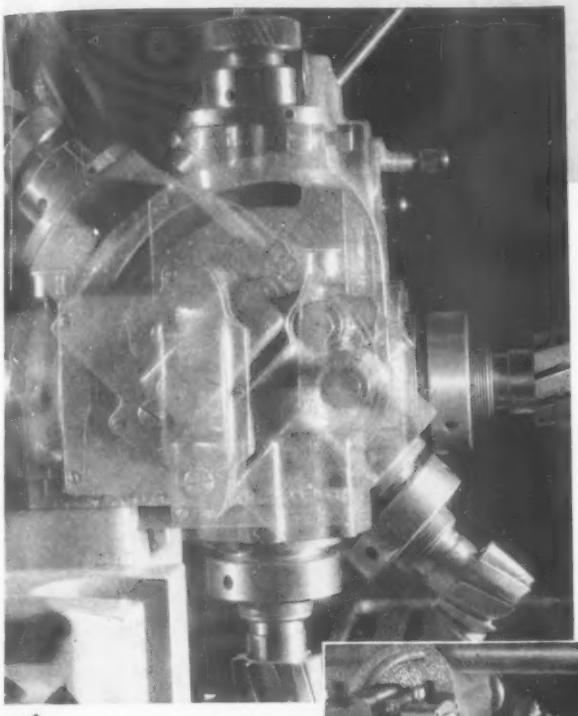
STANDARDS with Morse tapers (2 to 6) carried IN STOCK.

STURDIMATIC
TOOL COMPANY
5218 THIRD AVE. DETROIT, MICH.

VAN NORMAN

RAM-TYPE UNIVERSAL MILLERS

Save Set-Ups, Cut Cost on Milling



Idle machine time, caused by reset-ups, often cuts the productive capacity of milling machines by as much as 70%.

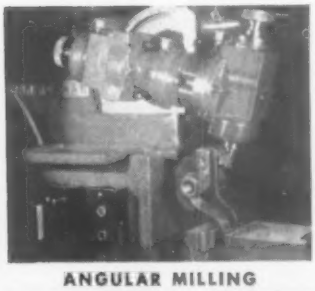
You can reduce these time-wasting reset-ups and increase machine and operator output up to 40% overall time with Van Norman Ram-Type Universal Millers.

Here's how it's done. The operator first sets up the workpiece. Then, by simply changing the position of the adjustable cutterhead from horizontal . . . to angular . . . or vertical positions, and by moving the movable ram in or out — the operator performs practically all his milling operations with minimum reset-ups. Result — faster work, greater machine capacity and less possibility of errors.

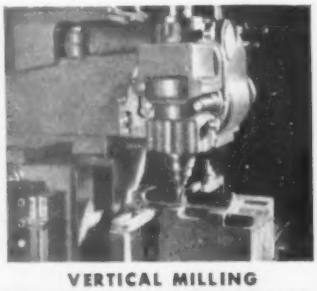
Add to the above advantages . . . directional front and rear controls of all power feeds, large easy-to-read dials . . . solid rigidity — and you'll readily see how Van Norman Ram-Type Universal Millers assure greater accuracy, increase output and cut costs.

⬆ ADJUSTABLE CUTTERHEAD Gives Vertical . . . Angular . . . Horizontal Milling — All on *ONE* Van Norman Ram-Type Universal Miller.

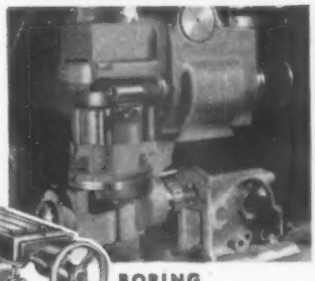
HORIZONTAL MILLING



ANGULAR MILLING



VERTICAL MILLING



BORING

SLOTTING

ANGULAR MILLING

No 22L
RAM TYPE UNIVERSAL MILLER

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

"It pays to Van Normanize"

MEETING OF MINDS, 1944

SYRACUSE, SEMI-ANNUAL MEETING A.S.T.E.

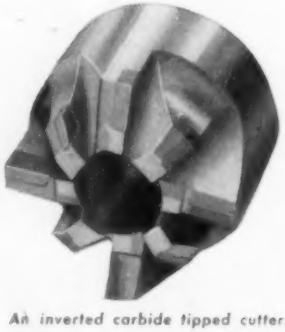
CLEVELAND, ANNUAL MEETING NATIONAL METAL CONGRESS

DETROIT, DAILY MEETING AMERICA'S LEADING MACHINISTS

The Fall of 1944 has been one of the most important periods in metal working history.

Meetings of machinists at Syracuse and Cleveland and in Detroit, the heart of the industry, give evidence that speculations of the last 4 years regarding new metals, processes and tools are beginning to jell.

Eclipse is in the center of all this thinking and has installed a new Research Department to keep pace.



An inverted carbide tipped cutter. No pin. Assurance against "cocking" of the cutter is provided by the ECLIPSE Balanced Drive.

Do you have our catalog number 43?

ECLIPSE COUNTERBORE CO.

founded thirty years ago

DETROIT 20, MICHIGAN

PASSING PARADE

Officers Elected—Directors of Motor Wheel Corporation have elected the following: H. F. Harper, President and General Manager; J. E. Garlent, Executive Vice President; D. L. Porter, Vice President and Treasurer; C. S. Holden, Sales Vice President; M. F. Cotes, Vice President, Duo-Therm Division; J. Harold Hunt, Secretary and Engineering Vice President.

Leaves Company—J. W. Baillie, Secretary and Treasurer, Detroit Lubricator Company, will leave that company to join the American Gas Machine Company of Minnesota as President.

Gilmer President—John S. Krauss is President of the L. H. Gilmer Company of Philadelphia, newest subsidiary of United States Rubber Company. Gilmer has been added to the Mechanical Goods Division.

Chief Engineer—S. C. Bennett has joined Lawrence Aeronautical Corporation as Chief Engineer. Since 1942 Bennett had been associated with Bell Aircraft at Buffalo and Marietta, Ga. Before this he was with Ranger Aircraft.

W. W. Vogt

W. D. Smith

Power Expert—Calgon, Inc., Hagan Corporation and Hall Laboratories jointly announce return of W. D. Smith to the textile and power field. Smith was recently released from the Army where he served in the Chemical Warfare Service with rank of major.

Professional Honor—Goodyear's Walter W. Vogt has been elected Vice Chairman, Division of Rubber Chemistry, American Chemical Society. Vogt has figured in many rubber developments since joining Goodyear Tire & Rubber Company in 1917. Graduate of Oberlin College, he has written many papers on rubber subjects.

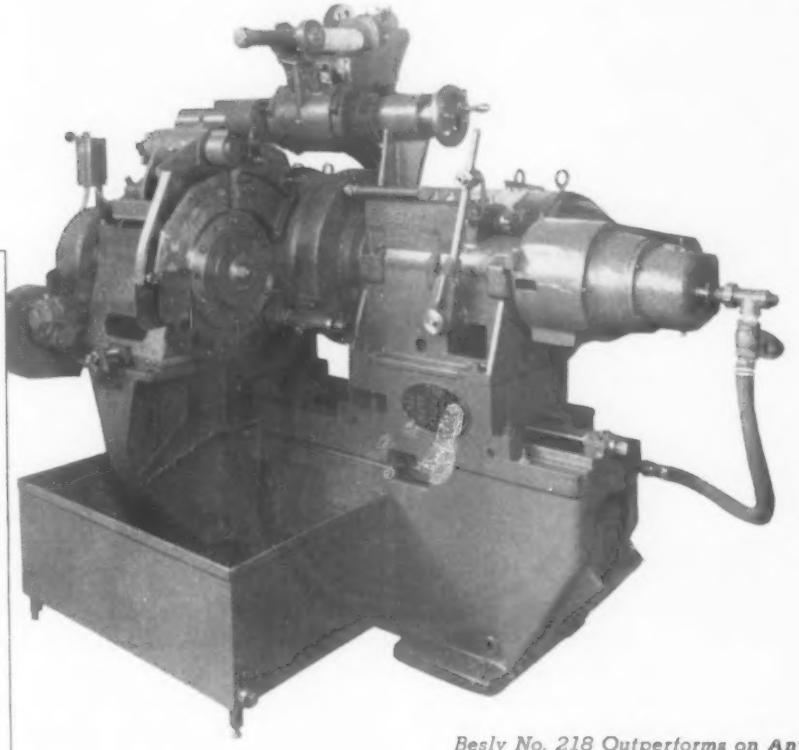
Company Official—Frank M. Howe, former Ex-Cello-O Corporation employee and more recently Crawford Door Company Chief Inspector, has been named General Sales Manager of the latter firm, according to F. W. Eaton, Plant Superintendent.

Aviation Officials—Air-minded Leopold H. P. Klotz has been elected Vice President and Treasurer of Luscombe Airplane Corporation, Trenton, N. J., according to President A. C. Hastings, Jr. Klotz has announced appointment of Frederick John Knack, as Vice President in Charge of Engineering. Knack recently resigned from Fairchild Aircraft.

(Continued on page 222)

THE PARALLEL SURFACE GRINDER FOR THIN PIECE ACCURACY

With All Its Variables Under Precision Control



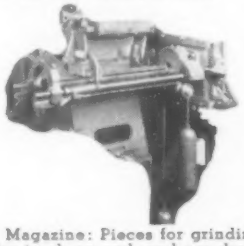
Besly No. 218 Outperforms on Any Job in Its Field

Here Are Some New Extraordinary Grinder Improvements . . .

Accurate Control of Feed Wheel and Guide: With the hand control, shown lower right, the feed wheel may be accurately adjusted to bring the work between the grinding wheels. The guide, above, centralizes the pieces in the feed wheel.

Segmented Feed Wheel: Grinding of thin pieces makes it necessary to construct the feed wheel from light gauge metal. By constructing the wheel in segments, warping is eliminated, production efficiency stepped up.

Wheel Dressing: The dressing tool, after hand location, is power driven and rigidly controlled so that grinding wheels are accurately and uniformly dressed at a substantial saving in time.



Pre-Loading Magazine: Pieces for grinding are set in this tubular track on end, and are drawn to the feed wheel by a counter weight. To speed production, a second magazine is loaded while the first is running.

The accurate parallel-grinding of thin pieces such as compressor piston rings, thrust washers, fuse plates, ball bearing races, etc. can now be handled at high production speed and within fine limits with the Besly No. 218 double-spindle grinder.

By employing a segmented feed wheel, warping due to heat has been eliminated. A hand wheel controls the positioning of both the feed wheel and its guides permitting quick accurate adjustment.

Other advantages in the No. 218 model are—magazine feeding of parts to the feed wheel, a power driven, highly accurate, time-saving wheel-dressing attachment, and centrifugal distribution of coolant to the grinding wheels through the hollow spindles. The No. 218 has the basic advantages of Besly engineering experience such as freedom from undue wear, elimination of wheel vibration, etc., to deliver accurately ground pieces at new low cost.

Write for details. Also ask for new Besly Titan Abrasives Catalog.

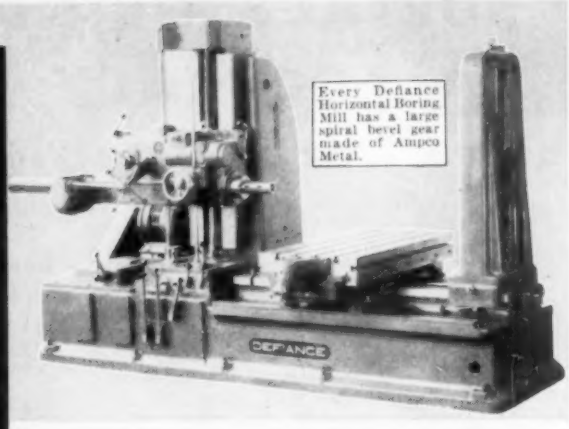
CHARLES H. BESLY AND COMPANY

118 N. Clinton Street., Chicago 6, Illinois **Factory: Beloit, Wisconsin**

BESLY

BESLY GRINDERS AND ACCESSORIES • BESLY TAPS • BESLY TITAN ABRASIVE WHEELS

Guarded against delays due to metal failure...



— with parts of wear-resisting

M-11

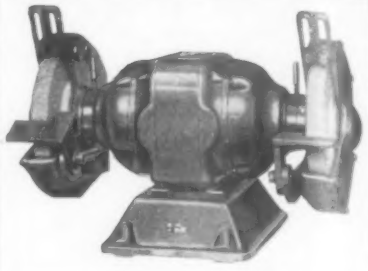
Ampco Metal

Like the builders of Defiance Horizontal Boring Mills, over 90 leading machine tool makers use Ampco Metal wherever they need exceptional strength, hardness, and resistance to wear, shock, and fatigue. This superior aluminum bronze alloy has controlled physical properties that give it several times the life of ordinary bronzes. Check for this protection of critical parts in the specifications of machines you buy. And replace worn parts of your older machines with durable Ampco. Write on business letterhead for File 41 of Engineering Data Sheets.

AMPCO Metal
The Metal without an Equal

Ampco Metal, Inc., Dept. TE-12, Milwaukee 4, Wis.

BALDOR
BALL BEARING **GRINDERS**



BUILT FOR HEAVY PRODUCTION SERVICE

BALDOR Grinder No. 800

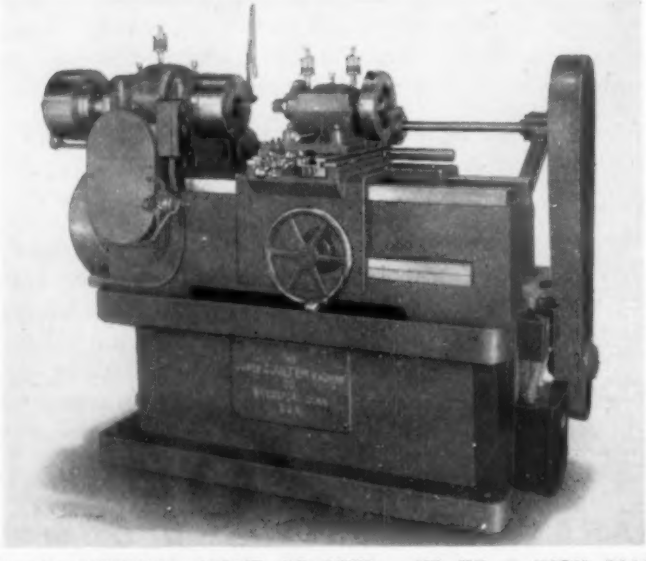
½ hp., ball-bearing motor, capacitor type; 1700 rpm., 110 volt, 1 phase, 60 cycle; 8" x 1" Aloxite wheels; enclosed guards and adjustable tool-rests. **$54.00**

Ask for Bulletin 319

BALDOR ELECTRIC COMPANY
4335 Duncan Ave., St. Louis 10, Mo.

BUILT BY MOTOR SPECIALISTS

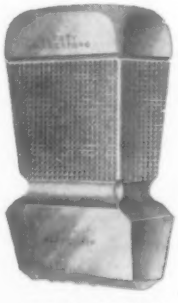
PRECISION THREAD MILLER
FULL AUTOMATIC CONTROL



INTERNAL OR EXTERNAL RIGHT OR LEFT — UP TO 7 INCH DIAMETERS
COMPLETE MOTOR EQUIPMENT — FIXTURE TO SUIT

The James **COULTER** *Machine Co.*
BRIDGEPORT • CONNECTICUT • U. S. A.

SAFETY
(Reg. Trade Mark)
"WEDGE GRIP"
STEEL HAND STAMPS



Pat. No. 2,089,794

Ideal for mass production markings of defense products . . . trade marks and symbols. Any size or number of characters available.

Write for Literature

M.E. CUNNINGHAM CO.
SAFETY STEEL STAMPS
169 Carson St., Pittsburgh 19, Pa.

They will fit into YOUR RETOOLING PROGRAM with *Precision*

Engineers' Glass
Comparator Charts
Projector Scales

• The success of your Retooling Program depends upon *Precision*—the methods by which *Precision* is attained. To obtain this *Precision* in your Retooling Program you will need *Engineers'*-Glass, *Engineers'* Comparator Charts, *Universal* Projector Scales and Rules.

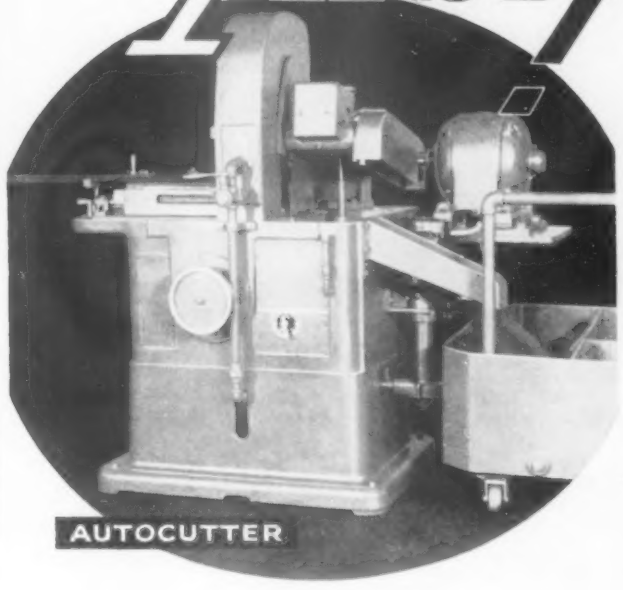
You can make accurate diagrams or layouts, in fine lines of any weight desired on the vellum coating of Engineers'-Glass. You can use them as charts on your optical projectors or comparators, or you can have them reproduced by us as Engineers'-Transparency Charts. We make as many of these identical duplicates as are required from one original drawing or scribing. In effect, this enables you to have a number of optical projectors located in one department, in various departments, or in separate plants all checking to the same original layout.

Our Engineering Department is making original layouts for many manufacturers for war production—to save time and attain precision. We can do the same for you to aid your Retooling Program.

Write us stating your particular precision problem. No obligation, of course.

ENGINEERS SPECIALTIES DIVISION
UNIVERSAL ENGRAVING & COLORPLATE COMPANY, INC.
980 ELLICOTT STREET BUFFALO 8, NEW YORK — TWIN PLANTS — 1919 EAST 19th STREET CLEVELAND 15, OHIO

IT'S A *First*



Yes, this **CAMPBELL "MODEL 700"** is the first *fully automatic* abrasive cutting machine ever built. Coming from **CAMPBELL**, manufacturers of the most complete range of abrasive cutters, that's big news.

This **"700"** is "first" another way. It is the opening announcement of **CAMPBELL'S** post-war program of development, based on wartime improvements all through the line. Other announcements will follow.

Maybe there's a way a **CAMPBELL ABRASIVE CUTTER** could speed up or economize your production. It's easy to find out.

WHY NOT DO THIS?

Write and tell us (1) the range of sizes, (2) kind of material, (3) length of cutoff pieces, (4) length of stock before cutting, (5) tolerance for length of cut pieces and (6) hourly production requirement. With this information, **CAMPBELL** engineers can recommend production procedure and work up cost sheets for you.

Campbell

ABRASIVE CUTTING MACHINES

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT · CONNECTICUT
ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ACCO **AMERICAN CHAIN & CABLE COMPANY, Inc.**
BRIDGEPORT · CONNECTICUT

"What a job costs is determined by what it accomplishes, not by the face of the invoice."

NATIONAL TOOL SALVAGE CO.
6511 Epworth Blvd.
Detroit 10, Mich.

LESS OPERATIONS
AND FAR
BETTER WORK
WITH A
GATCO
ROTARY PILOT BUSHING

Pilot bushing fits with a PUSH fit, therefore a perfect bore

ROUND-CHATTERLESS-SMOOTH

DUST-PROOF

AS A WATCH

GATCO Rotary jig and pilot bushing is built for core drilling, diamond boring, turret tool piloting, piloting hollow mills, line reaming, carbide boring, spot facing, etc.

Write for full information and prices

GIERN & ANHOLTT TOOL COMPANY
1308 Mt. Elliott Avenue, Detroit 7, Michigan

Deaths

Frank H. Reagan, 72, Board Chairman, Locke Insulator Corporation, died in Baltimore, during September.

Henry May, 83, died in mid-October in Buffalo, N. Y. He was a founder of the Pierce-Arrow Motor Corporation.

Edmund A. Russell, 78, a Director, Otis Elevator Company, died at Lake Forest, Ill.

Clinton W. Russell, 79, Palmer-Bee Company, Consulting Engineer for 18 years recently died. He was with Russell Wheel Foundry for 38 years before joining Palmer-Bee.

John H. MacMillan, 75, Board Chairman, Cargill, Inc., died in Minneapolis.

Maurice D. Musgrade, 45, Director, Binks Manufacturing Company, and Secretary, Celotex Corporation, died in Chicago.

Joseph S. Pendleton, Secretary-Treasurer, Carpenter Steel Company, died at Reading, Penna., following a heart attack. He joined Carpenter as Assistant Chemist in 1897 and had held many responsible company assignments.

Rowland Riehl, General Manager, Davis Boring Tool Division, Larkin Packer Company, died in St. Louis.

J. J. Larkin, President, Larkin Packer Company, died in St. Louis.

George H. Pratt, Sales Manager, retired, Cushman Chuck Company, died at Hartford, Conn.

J. W. Sullivan, 73, Board Chairman, Skilsaw, Inc., died at Evanston, Ill. He was founder of the company and had been Chairman since 1942.

CLASSIFIED ADVERTISING

The Tool Engineer
THE BRAMSON PUBLISHING COMPANY
2842 W. Grand Blvd. Detroit 2, Mich.

NEW PRODUCTS WANTED

WANTED
Gage Line

Leading Manufacturers Representative covering Metropolitan New York area is making a change. Desire line of Plug, Ring and Thread Gages. Currently handling large volume. Will finance accounts if desired. Highest financial responsibility and references. Quarter century outstanding performance. Reply Box 858, The TOOL ENGINEER.

SITUATIONS WANTED

REPRESENTATIVE

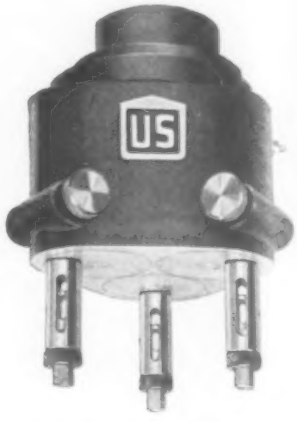
Sales representative for perishable tools, carbide or high speed, desires position for Greater New York and nearby territory. Available January 1. Highest credentials. Box 856, The TOOL ENGINEER.

* * *

AGENT

Manufacturer's Agent experienced in the New York metropolitan area, desires additional line of small tools. Reply Box 857, The TOOL ENGINEER.

STANDARD US SINCE 1915
HEADS



Three Spindle Head — All Adjustable For Equally Spaced Holes

FIVE TYPES FIFTY-SIX SIZES
ADJUSTABLE DRILL HEADS,
CAPACITIES UP TO 1½" DRILLS

SEND US YOUR B/PS

All Types of Fixed Center Heads

UNITED STATES DRILL HEAD CO.
Cincinnati 4, Ohio

DESMOND
GRINDING WHEEL
DRESSERS & CUTTERS

Desmond Hex Dresser

Desmond Cutters

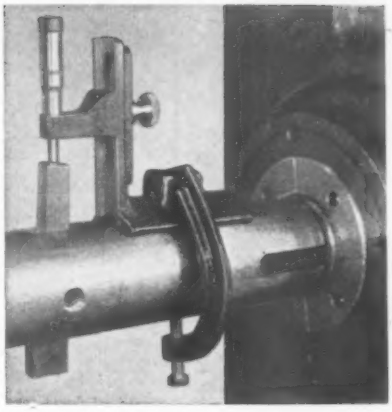
We manufacture the only complete line of Dressers and Cutters and will be glad to advise the proper type and size for your grinding wheels. Write for copy of our catalog "T" and name of your nearest dealer.

THE DESMOND-STEPHAN MFG. CO.
URBANA, OHIO

Also manufacturers of Simplex Steel Slide Vises.

BARTELT PEDESTAL Micrometer

formerly called Bartelt Tool Setting Gage



★ A BETTER, FASTER WAY TO SET BORING TOOLS FOR RETOOLING

As the picture shows, the Bartelt Pedestal Micrometer is clamped* onto a boring bar and the tool set to exact position with the micrometer head. There are two ways of doing this. (1) Take a rough cut, reset the tool to exact finishing size with this gage, and take the finish cut. (2) From the bar diameter, set the tool to exact size with the gage, and do the job in one cut. Either way, you will save a lot of time over the "cut-and-mike" system commonly used.

Many other uses . . .

The clamp is detachable, and the pedestal has both flat and vee surfaces on the base. Thus it can be used for a depth gage, a height gage, for inspection, for machine setups, and many other purposes. Write for our new circular. Also inquire about our Pedestal Indicator.

*Three clamps furnished with gage fit all size boring bars from 1" to 5" diameter.

BARTELT ENGINEERING COMPANY
1218-M Partridge Ave. Beloit, Wis.

New! Hammond SAFETY FEATURE ON ALL CUPWHEEL GRINDERS

LOOK! Hammond's EXCLUSIVE FEATURE!

SAFETY CUP DISC — *All Hammond cup wheel grinders furnished with patented safety cup discs as standard equipment It is the greatest safety unit ever installed on any carbide tool grinder . . . prevents operator getting fingers, or dropping tools, into cup of cup wheel.*

HAMMOND WET GRINDER *"You're dry when you grind wet." Patented No Spray — No Splash wheel guards.*

Hammond Machinery Builders INC.
KALAMAZOO 14, MICHIGAN

WRITE FOR BULLETIN 204

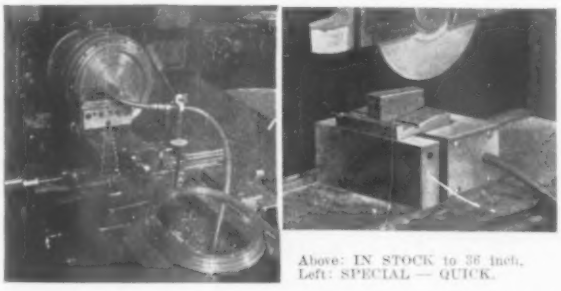
1636 DOUGLAS AVENUE
Eastern Branch: 71 West 23rd St., New York 10, N. Y.

NEW AND REVOLUTIONARY MAGNETIC CHUCKS for TOOL ROOM & PRODUCTION

POWER-GRIP

— Detroit, Mich. "We are pleased to say this has meant a 300% increase in production and a 5% reduction in scrap to this item." — Square Tool, Die & Mfg. Co.

Providence, R. I. "We take this opportunity to tell you that this is one of the finest and most useful tools in our plant." —Lawrence H. Cook, Inc.



Above: IN STOCK to 36 inch.
Left: SPECIAL — QUICK.

• These are only two of the many applications of our new Magnetic products. Our illustrated catalog, mailed upon request, shows others. We may have a dealer near you, to help with practical suggestions to save you money and time.

• Our products operate from special efficient, enclosed control units that plug into 110 Volt A.C. lighting circuits. Magnetizing voltage is only 6 Volts D.C. — safe, no shock, no heat, long lived.

ROCKFORD MAGNETIC PRODUCTS CO.
1015 Sixth Ave. — Rockford, Ill.

HARTFORD SUPER-SPACER

DRILLING
•
GRINDING
•
SLOTTING
•
JIG BORING
•
MILLING
•
PLANING

• In the illustration, the Super-Spacer is equipped with a face-plate for exceedingly precise location of the work in a jig boring operation.

• The Hartford Super-Spacer is proving to be a very useful addition to many tool rooms. It simplifies puzzling machining problems, and is easily set up to handle a wide variety of jobs. Indexing is not only accurate, but speedy. This unit affords a wide scope of service when equipped with face-plate and draw-in collet.

WRITE FOR LITERATURE

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD, CONN.

Diamond Tool

COST CONTROL

The Koebel Library of Conservation Information is available to help reduce the ultimate cost of your diamonds. Practical employee training literature on how to use—how not to abuse—diamond tools. Write today for details.

KOEBEL DIAMOND TOOL CO.
9442 Grinnell Ave., Detroit

WIRE ROPE CUTTER

Hand Power

•

Lever Action

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Weight 110 lbs.

•

Price $80.00

•

Immediate shipment from New York stock.

Lewthwaite No. C

The compactness and durability of this tool make it particularly adaptable for shipyard or field work.

All tools are thoroughly tested before leaving our plant.

Catalog No. 8 on request

T. H. LEWTHWAITE MACHINE CO.

307 E. 47th Street, New York 17, N. Y.

CLASSIFIED ADVERTISING

(Concluded from page 222)

REPRESENTATIVE

Young man with knowledge of steel, screw machines, wire forming and metal stampings would like position as Sales Representative. Now available. Married, draft deferred, free to travel. Now located in N. E. References. Write Box 850, The TOOL ENGINEER.

* * *

CANADIAN

34 years old seeks contact with American company contemplating business connections in Canada immediately or postwar. Seventeen years practical shop experience, seven in executive capacity; planning, designing, building tools, manufacture and assembly of parts. Proved ability in handling Canadian personnel. Excellent background for manufacturer's agent or representative. Reply Box 853, The TOOL ENGINEER.

SITUATIONS AVAILABLE

WANTED
Sales Engineer

A long established firm of jig and fixture designers and builders has several openings for tool men familiar with the trade in their territory. Give us your age, background, territory covered and salary required. Strictly confidential, Box 855, The TOOL ENGINEER.

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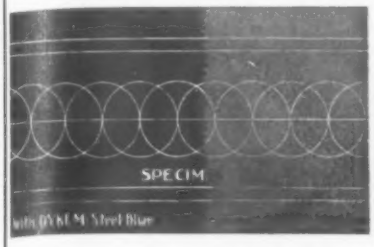

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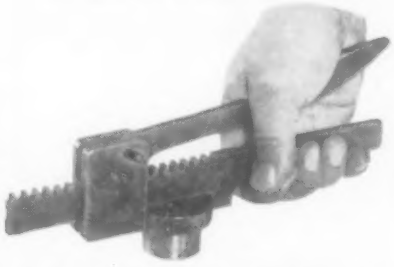

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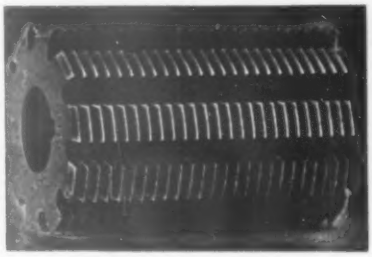

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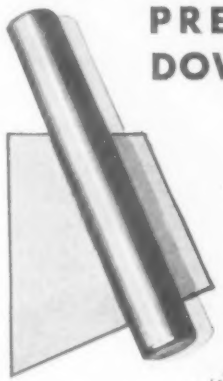

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Advertisers Appearing In This Issue

Acme Industrial Co. 199
Adamant Tool Co. 178
Advanced Tool Design Co. 224
Aico Tool Co., The 211
Allegheny Ludlum Steel Corp. 157
Am. Cutter & Engineering Corp. 199
Ames Co., B. C. 183
Ampco Metal, Inc. 132, 220
Archer & Smith, Ltd. 11
Armstrong-Blum Mfg. Co. 140
Armstrong Bros. Tool Co. 209
Aro Equipment Corp., The 149
Arter Grinding Machine Co. 148
Avey Drilling Machine Co., The 126
Axelson Mfg. Co. 180

Baker Bros., Inc. 116
Baldor Electric Co. 220
Barber-Colman Co. 108
Barnes Drill Co. 52
Barnes Corp., John S. 130
Barnes Co., W. F. & John 107
Barnes Co., Inc., W. O. 206
Bartelt Engineering Co. 223
Bay State Abrasives Products Co. 143
Behr-Manning Corp. 165
Besly & Co., Chas. H. 219
Bissett Steel Co., The 178
Black Drill Co. 154
Blake Co., Edward 172
Bliss & Laughlin, Inc. 150
Boyar-Schultz Corp. 158
Bradford Machine Tool Co., The 216
Brown & Sharpe Mfg. Co. 182
Bryant Chucking Grinder Co. 54
Buhr Machine Tool Co. 110

Campbell Div., Andrew C., Am. Chain & Cable Co., Inc. 221
Carboloy Co., Inc. 129
Carborundum Co., The 27
Carlton Machine Tool Co., The 184
Carpenter Steel Co., The 44
Cerro de Pasco Copper Corp. 199
Chicago Rawhide Mfg. Co. 182
Chicago Rivet & Machine Co. 158
Chicago Wheel & Mfg. Co. 25
Cincinnati Milling Machine Co., The 114
Cincinnati Shaper Co., The 127
Circular Tool Co., Inc. 211
Cleveland Automatic Machine Co., The 147
Cleveland Tapping Machine Co. 185
Cleveland Twist Drill Co., The 63
Climax Molybdenum Co. 167
Colonial Broach Co. 195
Columbia Tool Steel Co. 184
Colwell, S. G. 190
Cone Automatic Machine Co., Inc. 42
Continental Machines, Inc. 37
Cooper-Bessemer Corp., The 203
Cortland Grinding Wheel Co. 56
Coulter Machine Co., The James 220
Cullen-Friestedt Co. 208
Cunningham Co., M. E. 220
Cushman Chuck Co., The 144

Dalzen Tool & Mfg. Co. 30
Danly Machine Specialties, Inc. 225
Davis Boring Tool Co. 57
Davis & Thompson Co. 210
Desmond-Stephan Mfg. Co., The 222
Detroit Broach Co. 113
Detroit Die Set Corp. 156
Detroit Tap & Tool Co. 146
DeWalt Products Corp. 150
Dumore Co. 145
Dykem Co., The 225

Eastern Cutter Corp. 142
Eclipse Counterbore Co. 218
Engineers Specialties Div. 221
Ettco Tool Co. 215
Ex-Cell-O Corp. 21

Federal Products Corp. 15
Federal Tool Corp. 179
Firth-Sterling Steel Co. 14
Fitchburg Grinding Machine Corp., The 29
Fonda Gage Co. 124

Galland-Henning Mfg. Co. 170
Gallmeyer & Livingston Co. 208
Gammons-Hoaglund Co., The 180
Gardner Machine Co. 62
Garrison Machine Works, Inc. 176
General Aircraft Equipment, Inc. 159
General Engineering & Mfg. Co. 204
Giddings & Lewis Machine Tool Co. 8
Giern & Anholtt Tool Co. 222
Gisholt Machine Co. ..... 4th Cover
Glenzer Co., The J. C. 208
Gorton Machine Co., George 5
Gray-Mills Co. 176
Greenfield Tap & Die Corp. 66
Gulf Oil Corp. 169

Hammond Machinery Builders, Inc. 223
Hanchett Mfg. Co. 26
Handy & Harman 22
Hanna Engineering Works 198
Hannifin Mfg. Co. 64
Hardinge Bros., Inc. ..... Front Cover
Hartford Spec. Machinery Co., The 223
Haskins Co., R. G. 180
Haynes Stellite Co. 53
Heald Machine Co., The 135
Hobart Brothers Co. 210
Hole Engineering Service 225
Holliday & Co., W. J. 153
Hole-Krome Screw Corp., The 2
Hunt & Son, C. B. 148

Industrial Abrasives 131
International Nickel Co., Inc., The 17

Jarvis Co., The Chas. L. 9
Jones & Lamson Machine Co. 33

Kaufman Mfg. Co. 199
Kearney & Trecker Prod. Corp. 7
Kennametal, Inc. 196
Kent-Owens Machine Co. 171
Koebel Diamond Tool Co. 224

Landis Machine Co. 227
Landis Tool Co. 47
Latrobe Electric Steel Co. 38
Leach Machinery Co., H. 180
Lehmann Machine Company 182
LeMaire Tool & Mfg. Co. 201
Lempco Machine Co. 197
Lewthwaite Machine Co., T. H. 224
Lincoln Park Industries, Inc. 228
Lodge & Shipley Machine Tool Co., The 181
Logan Engineering Co. 4
Logansport Machine Co., Inc. 160, 175, 198
Lovejoy Tool Co., Inc. 193

McCrosky Tool Corp. 138
Machine Products Corp. 168
Macklin Co. 45
Madison-Kipp Corp. 10
Majestic Tool & Mfg. Co. 183
Masonite Corp. 36
Master Chrome Service, Inc. 142
Matthews & Co., Inc., Jas. H. 198
M-B Products 224
Mead Specialties Co. 202
Metal Carbides Corp. 160
Metrical Lab., Inc. 154
Micromatic Hone Corp. 18
Moline Tool Co., The 174
Monarch Steel Co. 120
Moore Special Tool Co., Inc. 39
Motor Products Corp. 24

National Acme Co., The 61
National Automatic Tool Co. 96
National Broach & Machine Co. 51
National Tool Salvage Co. 222
National Twist Drill & Tool Co. 32
New England Carbide Tool Co. 48
Nielsen, Inc. 190
Norton Co. 41

Ohio Crankshaft Co., The 133
Oilgear Co., The 49
O K Tool Co., The 212
O'Neil-Irwin Mfg. Co. 210
Oster Mfg. Co., The 43
Ott Machinery Sales, Inc. 225

Packer Mfg. Co. 225
Paper Converting Machine Co. 202
Parker-Kalon Corp. 55
Pioneer Pump & Mfg. Co. 185
Pipe Machinery Co., The 59
Plan-O-Mill Corp. 16
Porter Cable Machine Co., Inc. 152
Potter & Johnston Machine Co., The 19
Pratt & Whitney Div. ..... 2nd Cover
Producto Machine Co., The 182
Putnam Tool Co. 188

Quality Tool & Die Co. 6

Ransome Machinery Co. 210
Ready Tool Co., The 183
Redmer Air Devices Corp. 178
Reliance Electric & Engineering Co. 29
Richmont, Inc. 112
Rivett Lathe & Grinder, Inc. ..... 3rd Cover
Roberts Rubber Co., Weldon 158
Rockford Magnetic Products Co. 223
Ruthman Machinery Co., The 214

Safety Grinding Wheel & Machine Co. 35
Schauer Machine Co. 198
Scherr Co., Inc., George 204
Scientific Div., Acme Ind. Co. 184
Scully-Jones & Co. 205
Seneca Falls Machine Co. 40
Severance Tool Industries, Inc. 13
Sheffield Corp., The 123
Shell Oil Co., Inc. 23
Sidney Machine Tool Co., The 137
Simonds Saw & Steel Co. 152
Skilsaw, Inc. 187
Smit & Sons, J. K. 181
Snyder Tool & Engineering Co. 46
Socony-Vacuum Oil Co., Inc. 34
South Bend Lathe Works 213
Standard Gage Co., Inc. 1
Standard Oil Co., (Indiana) 31
Staples Tool & Engineering Co. 119
Starrett Co., The L. S. 100
Stokerunit Corp. 207
Stuart Oil Co., Ltd., D. A. 181
Sturdimatic Tool Co. 216
Sundstrand Machine Tool Co. 155
Sunnen Products Co. 189
Super Tool Co. 121
Swartz Tool Products Co., Inc. 194

Taft-Peirce Mfg. Co. 50
Tannewitz Works, The 192
Thompson & Son Co., The Henry G. 156
Tungsten Electric Corp. 106
Turner Machinery Co. 12
Tuthill Pump Co. 179

Union Carbide & Carbon Corp. 53
United Precision Prod. Co. 226
U. S. Drill Head Co. 222
U. S. Machine Tool Mfg. Corp. 225
Universal Engineering Co. 181
Universal Vise & Tool Co. 209
Universal Wheel & Abrasive Corp. 141

Van Norman Co. 217
Vascoloy-Ramet Corp. 60
Vickers, Inc. 139
Vinco Corp. 20
Vulcan Tool Co., The 151

Wales-Strippit Corp. 175
Warner & Swasey Co. 95
Welding Equipment & Supply Co. 125
Weldon Tool Co., The 122
Wells Mfg. Corp. 118
Wheel Trueing Tool Co. 36
Whistler & Sons, Inc., S. B. 177
Wickman Corp., The 191
Willey's Carbide Tool Co. 184
Wilson Mechanical Instrument Co., Inc. 214
Winter Bros. Co. 136
Woodworth Co., N. A. 161
Wrigley Jr., Co., Wm. 179
Wyzenbeek & Staff, Inc. 208

Ziegler Tool Co., W. M. 186

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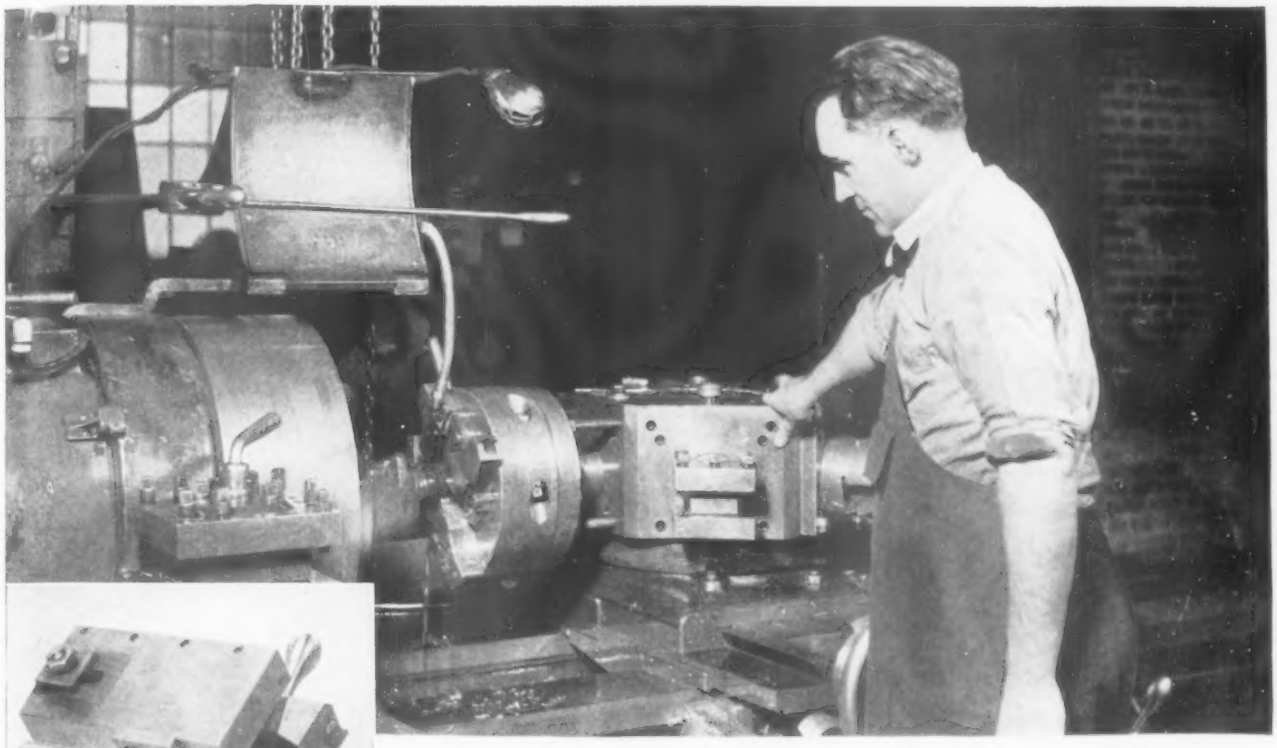

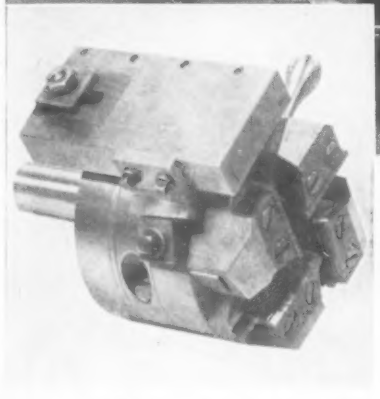

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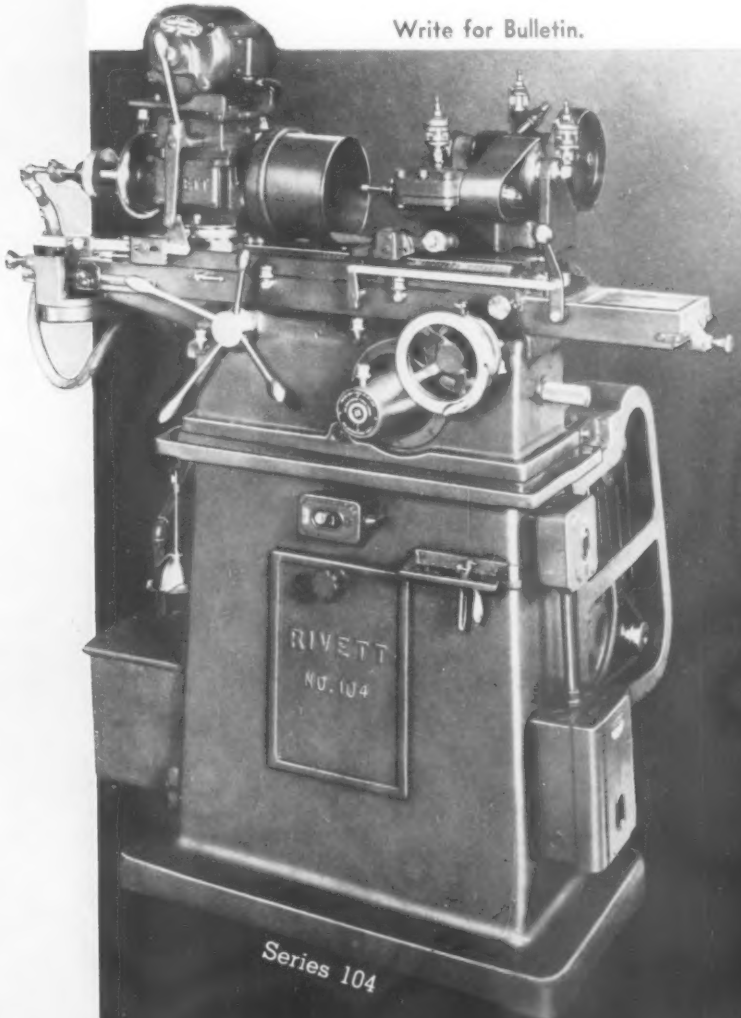

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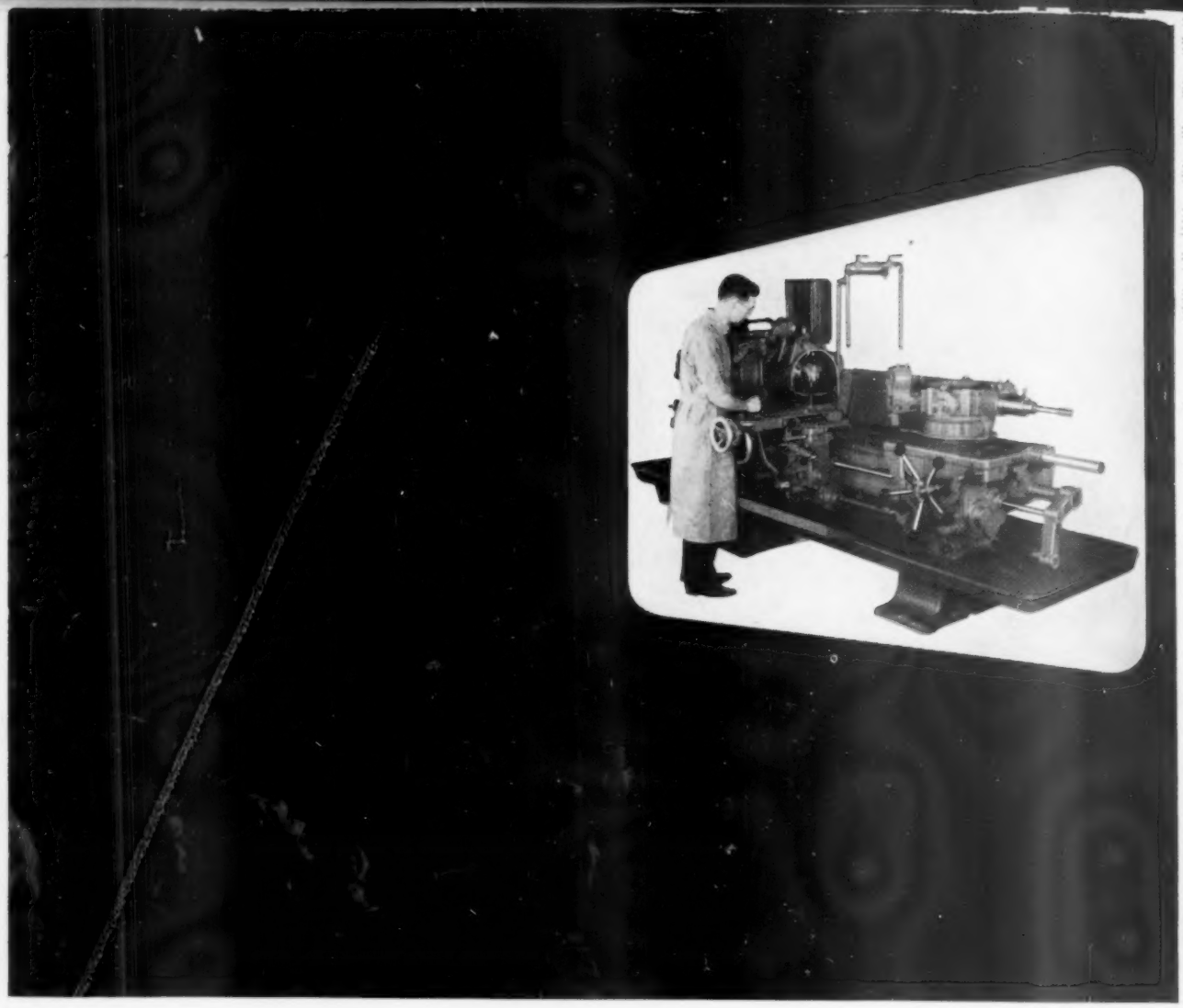

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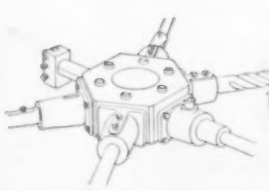

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